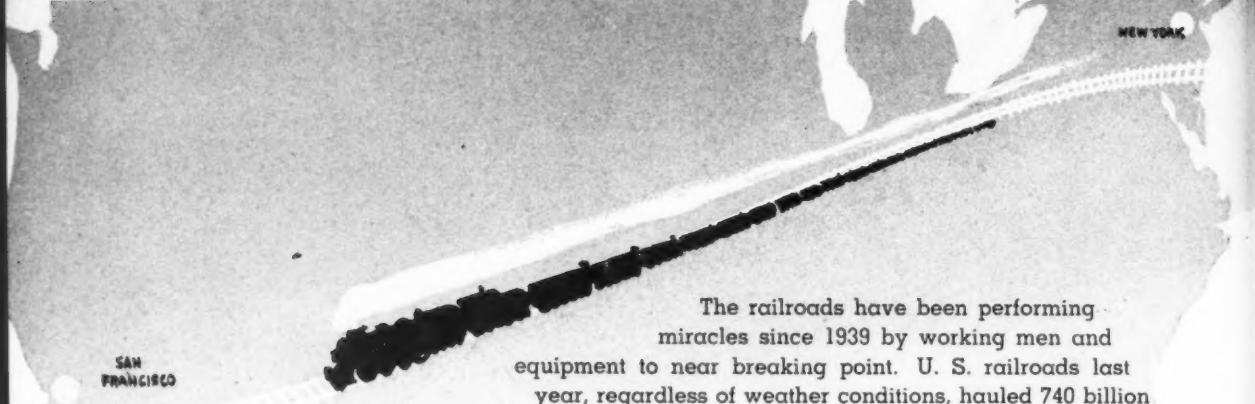
IT WAS A LONG WAY FROM BERLIN TO TOKYO

BUT... AMERICAN RAILROADS MADE IT SHORTER.....



The railroads have been performing miracles since 1939 by working men and equipment to near breaking point. U. S. railroads last year, regardless of weather conditions, hauled 740 billion ton-miles of freight, more than double the 1939 total. Passenger miles trebled in the 5 years to 96 billions. The last few months the railroads faced the task of moving as many troops across the U. S. continent as they had done in the past three years. Traffic to Los Angeles was near capacity, while 13,000 Government freight cars rolled into San Francisco daily. (1,000 a year ago). Now, the returning veterans will need more space on trains to carry them home to every point in the U. S.

Every American citizen is today conscious of the job the railroads have been doing, and, that faced with serious man-power and equipment shortages, it has been difficult to provide the usual high degree of efficient maintenance on track.

"EDGEMARK OF QUALITY"

RELIANCE HY-PRESSURE HY-CROME SPRING WASHERS

have been doing their bit by keeping rail joint assembled parts TIGHTER LONGER . . . thus helping to save critical man-power and material by automatically compensating for inevitable wear and maintaining that all important bolt tension in assembled parts. When post-war rail requirements are released, remember RELIANCE HY-PRESSURE HY-CROME SPRING WASHERS are an important *quality* railway accessory.

Write for illustrated Track folder today.

EATON

EATON MANUFACTURING COMPANY

OFFICES AND PLANTS **MASSILLON, OHIO**

Reliance Division

Sales Offices: **New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal**

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933 at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

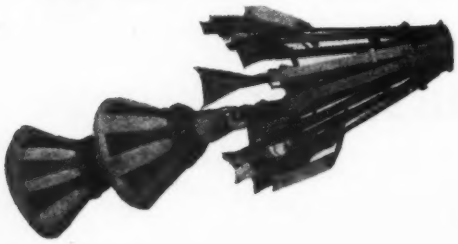
Before cleaning

After cleaning

CLEAN PIPES increase efficiency

Your railroad can increase pipe efficiency by having sludge and incrustations thoroughly removed. Clean pipes mean better pipe usage and are one factor in offering better customer service.

Our tools, engineers, and experience are available to do a better pipe cleaning job for your railroad than anyone else.



PITTSBURGH PIPE CLEANER CO.

433 Melwood Street, Pittsburgh 13, Pa.

Send for information outlining our complete contract pipe cleaning service.

FLEX-TOE Will Pull Spikes Like These Out of Your Track . . .

- MOVABLE TOES GRAB SPIKES
- HOLD TIGHTLY
- NO DRIVING NECESSARY . .

Faster and Safer Way To Pull Spikes

SEE those spikes above? They were actually pulled with a Flex-Toe Claw Bar by ONE MAN without a helper. This new bar not only removes brine-eaten and headless spikes or bolts, but also the ordinary kind faster and safer. **There's nothing new to learn.** Flex-Toe is thrown onto spikes in the usual way. Movable toes grab hold of any piece of protruding metal. **There's nothing to adjust.** As the handle is pulled, the toes take tighter hold and the spikes or bolts come out. **No driving is necessary.** These features were developed in the Flex-Toe Bar to speed spike pulling operations, provide a means of pulling spikes of ALL kinds, and to materially increase safety. Flex-Toe is receiving favorable and wide general acceptance. And remember, your claw bar costs will go down plenty when you use Flex-Toes.

You Only Need To Replace The Toes

Manufacturers of The Famous Devil Line of Track Tools

WARREN TOOL CORP.
WARREN, OHIO

ASK RIVETERS... *they'll tell you*

"Thor hammers FEEL right!"

EXPERIENCED RIVETERS know by the "feel" of a hammer when it starts whether or not it will hit hard, steady blows smoothly without excessive vibration. They find in Thor Riveting Hammers the "right touch"—because of a number of Thor design and construction advantages. *Positive throttle control* is just one of these Thor advantages—accomplished by main valve action that is so sensitive and perfectly controlled that the tool can be throttled to strike a single blow, or started slowly and increased in speed and power just as gradually as the operator desires . . . without jerks or "kick-backs." Write today for information about all Thor Air Tools in Catalog 52-B.

INDEPENDENT PNEUMATIC TOOL COMPANY

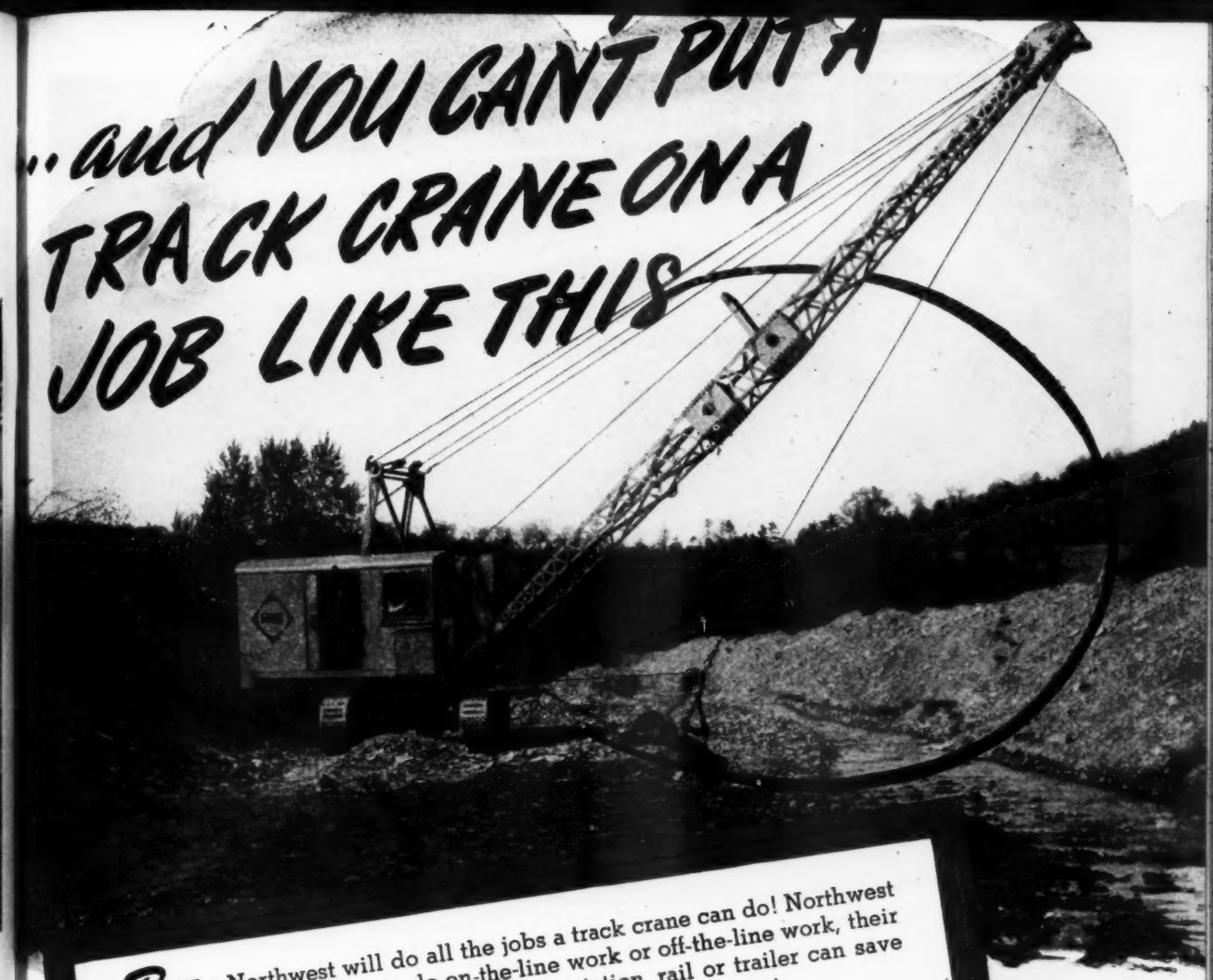
600 West Jackson Boulevard, Chicago 6, Illinois

New York Los Angeles

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

...and YOU CAN'T PUT A TRACK CRANE ON A JOB LIKE THIS



BUT a Northwest will do all the jobs a track crane can do! Northwest versatility, their ability to do on-the-line work or off-the-line work, their adaptability to several forms of transportation, rail or trailer can save the railway money on future maintenance and improvement.

In the first place all Northwests are convertible from shovel to crane or dragline—simply, quickly, by changing booms. It is not a one purpose tool.

In the second place as a crane it will handle any equipment for handling material that can be hooked to a cable.

In the third place its versatility, easy mobility and smooth control, permits it to load and unload itself under its own power on a standard flatcar or low bed trailer to get to the work. It can be loaded anywhere along the line and work along the right-of-way or travel off the right-of-way for off the track jobs.

Lastly, it brings you a combination of features that give you a distinct advantage for increased speed and output over track equipment and other crawler equipment.

Let us send you a catalog on the size machine that interests you. Practically all class 1 Railways are using Northwests.

NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL

Northwest Engineering Co., 1713 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Ill.

A Tocco induction heat-treating machine for hardening track shoe pins in the Oliver "Cletrac" plant.

It's our "treat"

On a crawler tractor, the track shoe pins are subjected to destructive abrasion shocks and strains. To resist these . . . to assure longer pin life, Oliver "Cletrac" tractors have hardened pins . . . electrically heat-treated to an exact depth by the most modern methods.

This *extra* quality is characteristic of every Oliver "Cletrac" tractor part . . . a basic feature of every manufacturing operation.

Quality is fundamental to every production step in the modern Oliver "Cletrac" plant . . . in materials, workmanship, and equipment.

Maintenance of that standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors . . . for your every need.

CLETRAC

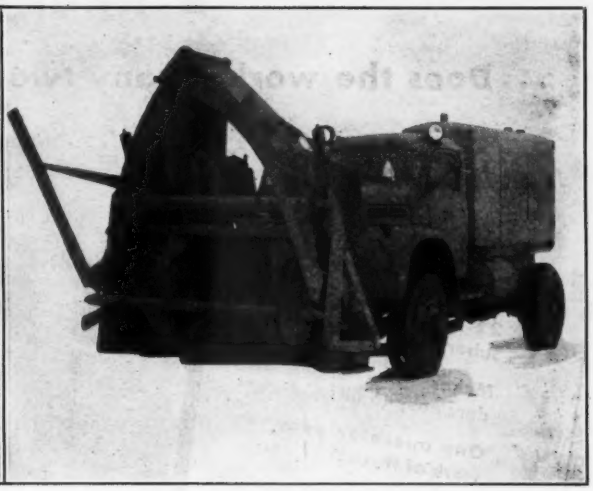
a product of

The OLIVER Corporation

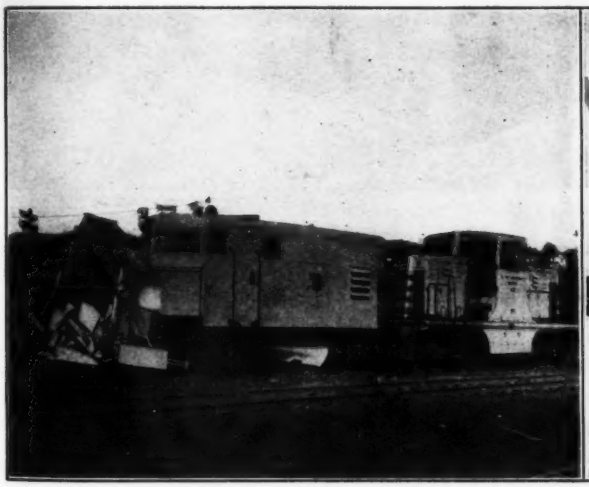
THE OLIVER CORPORATION
Cletrac

MASTER OF SNOW AND ICE

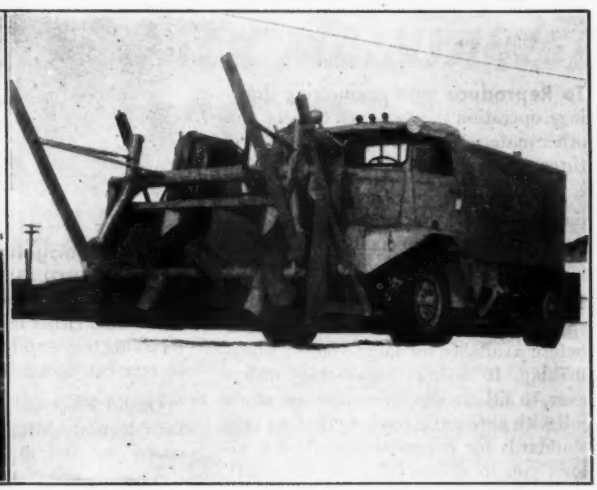
BROS ROTARIES BY THE HUNDREDS were used by the Army to keep military roads and airports open when demands of strategy called for undelayed advances in both Europe and America.



THE NAVY USED BROS ROTARIES to keep the airports open so that the heavy demands of flight transportation could be met daily without needless and costly delays or interruptions.



RAILROADS USED BROS ROTARIES to keep their main lines open and to remove the ice hazard in open stations and in congested switch yards. A loading chute permits side-loading into cars.



CITIES, COUNTIES AND STATES used Bros Rotaries to keep the streets and highways open for the Nation's traffic. Wm. Bros Boiler & Manufacturing Company, Minneapolis 14, Minnesota.

Give us your Snow Problems—we'll give you the answer

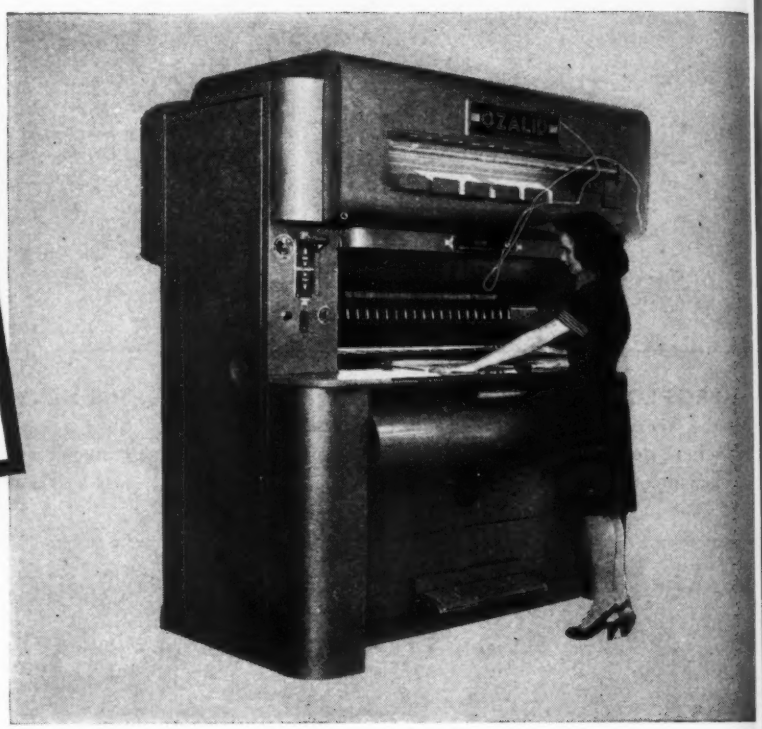
BROS

FABRICATORS OF STEEL • BOILERS • STOKERS • TANKS • ROAD EQUIPMENT

New! The OZALID PRINTMASTER

...Does the work of any two other printmaking machines!

- ✓ 22 features save time, labor, money!
- ✓ Makes "impossible" orders easy to fill!
- ✓ One operator does the work of three!
- ✓ Automatically stacks originals and prints!
- ✓ Makes all 10 types of Ozalid prints in seconds!



To Reproduce your engineering drawings, operation sheets, typed reports, and other material . . . you may be using two, three, or more printmaking machines.

Even so, you are probably *not* equalling the volume you could turn out with *ONE* Ozalid Printmaster and *ONE* operator!

The OZALID Printmaster provides speed, flexibility, and versatility never before available for large-volume printmaking. It makes "impossible" orders easy to fill. It simplifies the operator's job with automatic controls that set new standards for dependability. And it allows you to utilize fully the versatility that *only* the Ozalid Process affords!

All 10 Types of Ozalid prints (on paper, cloth, foil, or film) are made *in seconds* with the *Printmaster*. There are just two steps, both automatic: Exposure, and *Dry* Development. To make a black-line, blue-line, or red-line paper print from an average pencil tracing takes only *7 seconds*. An ink tracing reproduces even faster. Beautiful Ozalid *Dryphotos*—continuous-tone *photographic* prints—take only a few seconds longer!

One Operator easily does the work of three . . . as all controls are automatic or require only "finger-tip" attention.

Both your originals and your finished prints are AUTOMATICALLY *returned* and *stacked* in correct order! The prints can be stacked either in the front or the rear receiving tray—and the *change* from front to rear can be made instantly!

Ozalid Electronic Speed Control permits instant shifting to any speed between zero and 30 feet per minute.

Altogether, there are 22 new design features for more efficient operation!

The Saving in Time and Labor alone will soon "write off" the cost of *your* Ozalid *Printmaster* . . . and then go on to pay dividends for years.

Maintenance requirements are few... and if your floor space is at a premium, the *Printmaster* can help—it requires *only 18 square feet*.

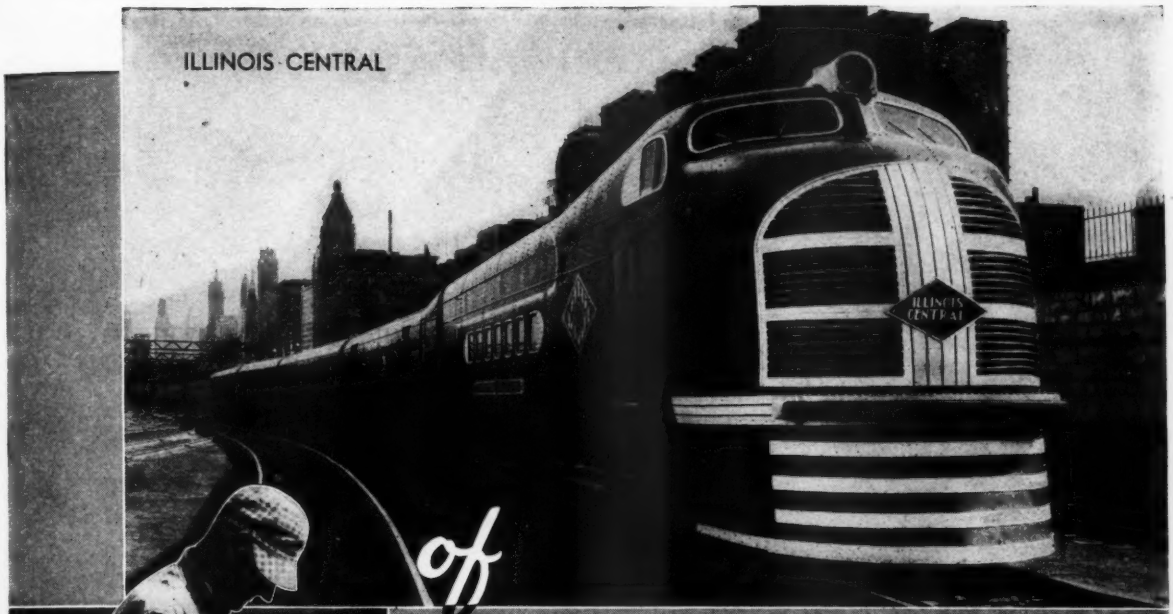
In addition to reducing your present printmaking costs, you'll find that the *Printmaster* will extend your use of prints to all departments . . . allowing you to establish new and more economical routines, and do jobs you never considered within the scope of technical reproduction equipment.

SEND FOR THE FREE *"OZALID PRINTMASTER BOOKLET"*—containing samples of the 10 different types of prints you can make.

OZALID

DIVISION OF GENERAL ANILINE AND FILM CORPORATION • JOHNSON CITY, N. Y.

OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL



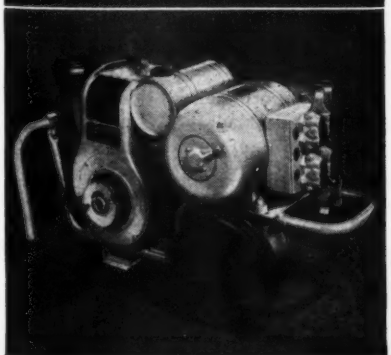
of

America's Crack Trains

4 out of 5

RUN ON TRACK MAINTAINED

with JACKSON VIBRATORY Tampers



In the face of labor shortage, terrific traffic, and the pounding of millions of tons of essential freight, it takes heroic doing to maintain track that will safely and comfortably sustain the high speed of America's Crack Trains. Our hats are off to the Maintenance Engineers and Trackmen for doing the well-nigh impossible. That the vast majority of them have used JACKSON VIBRATORY TAMPERS and PORTABLE POWER UNITS in this great accomplishment is a source of real satisfaction to us and sound evidence that in the opinion of the leaders, they constitute the medium for doing the best possible job in the shortest possible time. Let us send you the complete facts concerning JACKSON VIBRATORY TAMPERS & POWER UNITS and how to use them to best advantage.

The JACKSON WS-4 . . a light-weight, easily portable and highly dependable Power Unit with capacity for operating 4 Tampers; Floodlights and B&B tools. The "WS-8" will serve 8 Tampers and is still a very easily maneuverable Power Unit.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan

PUT A

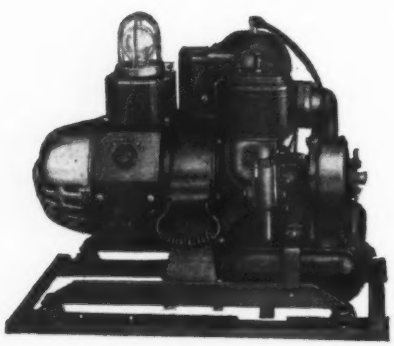
HOMELITE

ON THE JOB

AND GET IT DONE

MUCH FASTER

Small enough for one man to carry, a 2000 watt Homelite Gasoline-Engine-Driven Generator produces enough electric power to operate time-saving tools in the hands of several men. *



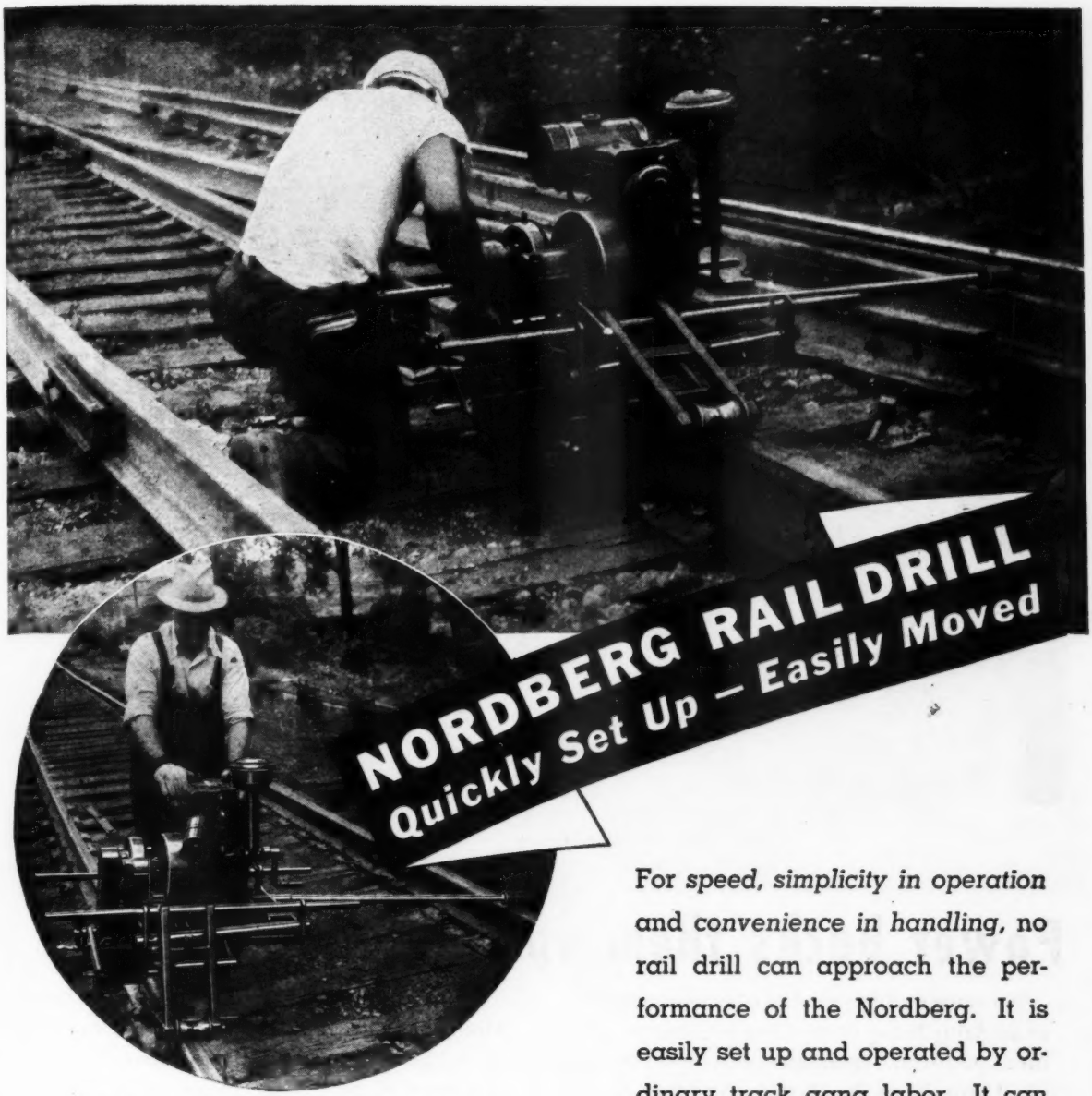
Capable of producing more horsepower per pound than other portable generators, a Homelite gives you longer and better service with less trouble and maintenance. Self-lubricating, air-cooled, and equipped with over-size ball bearings, the Homelite built-in two-cycle gasoline engine stands up dependably under all types of tough working conditions.

* Just one of many uses for a Homelite. Send for our new booklet showing all the time-saving uses of Homelite Portable Generators, Pumps, and Blowers.

HOMELITE CORPORATION

Portable PORT CHESTER, NEW YORK

PUMPS • GENERATORS • BLOWERS



NORDBERG RAIL DRILL
Quickly Set Up — Easily Moved

Whether drilling or moving, the machine is always on the rail. When moved from job to job, it is raised to ride on the flanged rollers of the supporting arms and pushed along the track — an easy one man job.

OTHER NORDBERG TOOLS

Adzing Machine	Power Jack
Spike Puller	Rail Grinders
Power Wrench	Track Shifter

For *speed, simplicity in operation* and *convenience in handling,* no rail drill can approach the performance of the Nordberg. It is easily set up and operated by ordinary track gang labor. It can be placed either on the inside or outside of the track and at close quarters at switches and guard rails. Wherever rail is drilled there is need of this time and labor saving machine.

NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

MOVE LONG RAIL

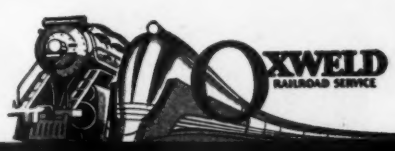
with simple equipment

● The long length of oxy-acetylene pressure-welded rail as you see it above is supported on pushcars and buggies at 80-ft. intervals and is being drawn by two motor cars. It is on its way from the welding yard to its final position in track. To handle it required only a 10-man section gang. No locomotives, no cranes, and no flatcars were necessary.

Such improved and simplified methods of transporting continuous rail of almost any desired length have resulted in substantial savings in equipment and man-hours. This has become important because oxy-acetylene pressure-welded rail is now used extensively in open track as well as through heavy-maintenance sections such as bridges, tunnels, and street crossings.

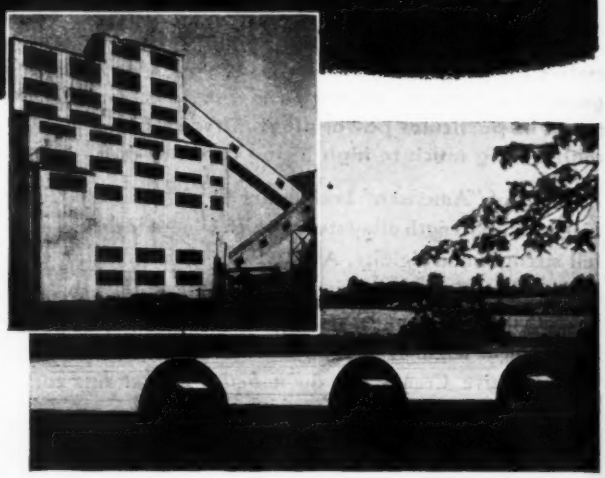
Pressure-welded rail is continuous. End batter therefore is eliminated and there is no need for joint maintenance. Plan your pressure-welding program now. Any Oxweld representative will be glad to help you.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York



SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

It's the ZINC *that Stops the Rust!*



ALL credit to steel, a staunch and strong building material! It's worthy of the best protection you can give it—and the U. S. Bureau of Standards says ZINC is "by far the best protective metallic coating for rust-proofing iron and steel"... So long as steel is coated with zinc, it can not rust; and since the life of a zinc coating is *at least* proportional to its thickness, the heavier the coating, the longer it will protect the underlying steel.

Cut Costs! Save Material! Reduce Maintenance!... with ZINC

It is sound sense and simple economy to use zinc wherever possible for the protection of iron and steel—in buildings, in equipment, in machinery. Good design that includes zinc-protected steel will cut costs, not only in the original saving of material but also in subsequent maintenance. Heavy zinc coatings insure greater durability and longer service life—that is a demonstrated scientific fact; so for economy, *specify heavy coatings.* They cost but little more, yet pay enormous dividends in greatly increased durability and reduced maintenance costs.

Interesting and Valuable Information About Zinc

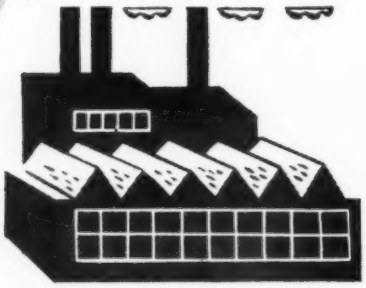
We want you to know more about zinc. Won't you please send us your name and address and let us mail you, without charge, these interesting and valuable booklets? Your address on a postal will do.

American Zinc Institute
INCORPORATED
60 East 42nd Street, New York 17, N.Y.

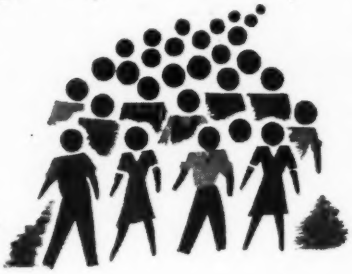
what the PAYROLL SAVINGS PLAN *means*

To you

To your Industry



and your Employees



Facts and figures prove **the Payroll Savings Plan to be a tremendous national asset. Through this plan, no less than 27,000,000 workers have so far saved more than $13½ billions to help speed victory . . . forestall inflation . . . and build peacetime prosperity!**

Did you know that yours is one of 240,000 companies maintaining a Payroll Savings Plan? Not only is this combined effort fostering national security, but also creating a lucrative postwar market for you . . . and all American industry!

Have you realized that 76% of all employed in industry are now enrolled in the Payroll Savings Plan . . . averaging a $25 bond each month per employee? Through this plan, millions are now looking forward to homes, educational opportunities and old age independence!

Surely, so great an asset to your country, your company and your employees is worthy of your continued . . . and increased . . . support! Now is the time to take stock of your Payroll Savings Plan. Use selective resolicitation to keep it at its 7th War Loan high! Keep using selective resolicitation to build it even higher!

The Treasury Department acknowledges with appreciation the publication of this message by

Railway Engineering and Maintenance

This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council

It's as simple as it looks

AIR TAMPING...

... first of all, air tamping takes the lightest tie tamper known — the Ingersoll-Rand MT-3. The operator has only to guide it as the machine does the work. And the work is always uniform as the tamper strikes steady, even blows all day long. Fatigue does not affect the machine and its light weight and easy-holding qualities reduce operator fatigue to an absolute minimum.

To speed up your tie tamping operations, we suggest you investigate the MT-3 tamper and also I-R air compressors for the air power — both off- and on-track units are available.

AIR TOOLS
COMPRESSORS
ROCK DRILLS
TURBO BLOWERS
CONDENSERS
CENTRIFUGAL PUMPS
OIL & GAS ENGINES

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

11-694

FLEXIBLE ARMOR

for STEEL and CONCRETE...

To assure *complete* protection a coating must become an integral part of the surface it covers... expanding, contracting, moving with the structure itself.

Bridges, piers, tanks, smoke chambers, abutments and piling ...they all need the flexible armor protection that Flintkote offers.

This asphaltic-base coating resists cinder abrasion, corrosive locomotive blast, acid-forming seepage and weather. It *seals out* corrosion, and puts a tough, resilient surface between the structures and flying cinders. The base materials *cannot* erode when protected by Flintkote.

This elastic armor is easy and quick to apply... and one "plating" lasts for years. It will not sag or flow under heat or crack from cold. The cost is truly economical.

Behind Flintkote Products are more than 40 years of experience ... painstaking development work to assure that each product bearing the Flintkote name is more than adequate for the job it was designed to do. Write for complete information.

FLINTKOTE INDUSTRIAL PRODUCTS

THE FLINTKOTE COMPANY

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Industrial Products Division

Atlanta • Boston • Chicago Heights • Detroit • Los Angeles • New Orleans
Washington • Montreal • Toronto

HIGH-BALLING AIR

Here's another member of the Blue Brute Track Team — a modern, ahead-of-its-time compressor on track chassis that is as full of sure-fisted power as it is modern.

This is the rail car compressor you can count on . . . ready to help you with your present burdens today. Smoother air delivery . . . smoother operation . . . construction that promises many thousands of feet of low-cost air compressing . . . furnished in propelled or non-self-propelled types.

Feather* Valves — simplest known — keep it easy-breathing. Cradling engine and compressor in one unit by three-point suspension avoids distortion. Full force-feed lubrication keeps the "works" healthy.

Moving off and on the tracks is a cinch. Tie this fellow up with a crew of Blue Brute WTT-7 Tie Tampers — lighter but stronger, with new leak-proof air throttles — and you'll have a Blue Brute Track Team that can set you some new records.

*Reg. U. S. Pat. Off.

4H-5-1

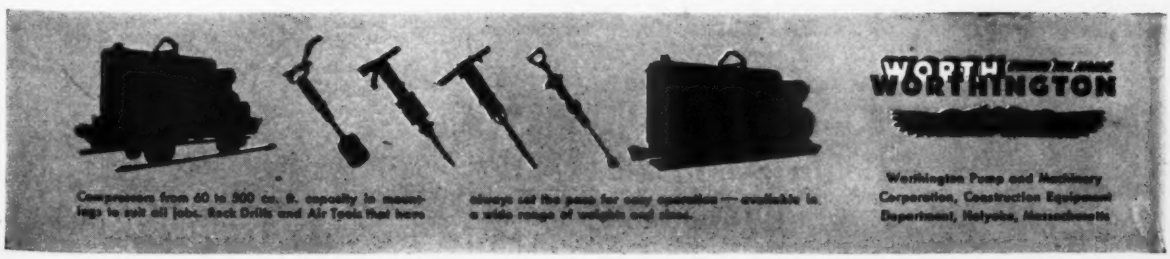
Behind the Fighting Fronts with

BLUE BRUTES

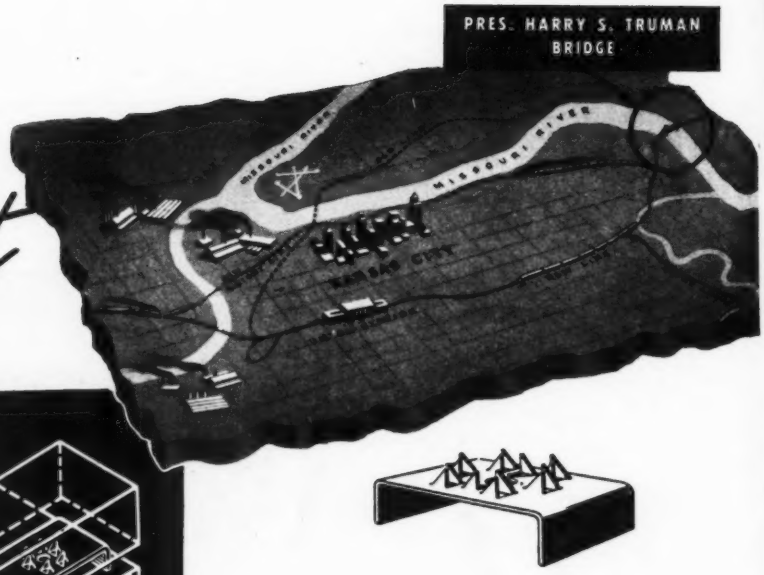
Right behind the fighting men come the Blue Brutes, helping speed the building of better railroads to get men and materials to the front fast. Blue Brute Track Teams also work overtime here at home helping U. S. railroads do the biggest transportation job in history.

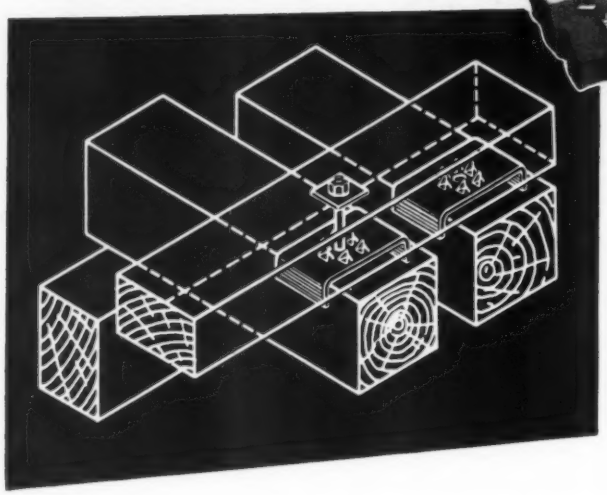
Get more **WORTH** *from air with* **WORTHINGTON**

BUY BLUE BRUTES



TIES *Tied Tight*





TECO CLAMPING PLATES *Provide Positive* "FIX" BETWEEN GUARD RAIL AND TIES ON NEW ROCK ISLAND SPAN

THE NEW PRESIDENT HARRY S. TRUMAN BRIDGE, which spans the Missouri near Kansas City, means better, faster, and more efficient service for the patrons of the Rock Island and Milwaukee Roads.

The *building* of the bridge is an expression of a fixed policy of constant improvement adopted long ago by the engineering departments of the two roads. Its *design* is also an expression of this policy.

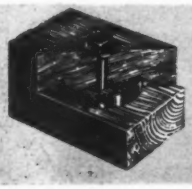
The ties on this new structure will remain evenly spaced under rails and guard rail because each is positively fixed at each end by a TECO FLANGED CLAMPING PLATE. The plate was developed by the Timber Engineering Company as a result of suggestions by Rock Island engineers.

Clamping plate timber connectors provide the most modern means of attaching ties to guard rail rigidly . . . with low maintenance cost. Bolts are used in every third or fourth tie which lowers replacement costs. Fewer bolt holes mean fewer traps for moisture in the timbers . . . and longer life.

Design your next bridge for TECO TIE SPACERS. Get design data by using the coupon below . . . NOW.

Timber Engineering Co., Inc. of Washington, D.C.

Washington • Chicago • New Orleans • San Francisco



SPECIFY TECO CONNECTORS
SPLIT RINGS • SHEAR PLATES
GROOVING TOOLS

USE THIS COUPON

Timber Engineering Company
1319 Eighteenth Street, N. W., Washington 6, D. C.

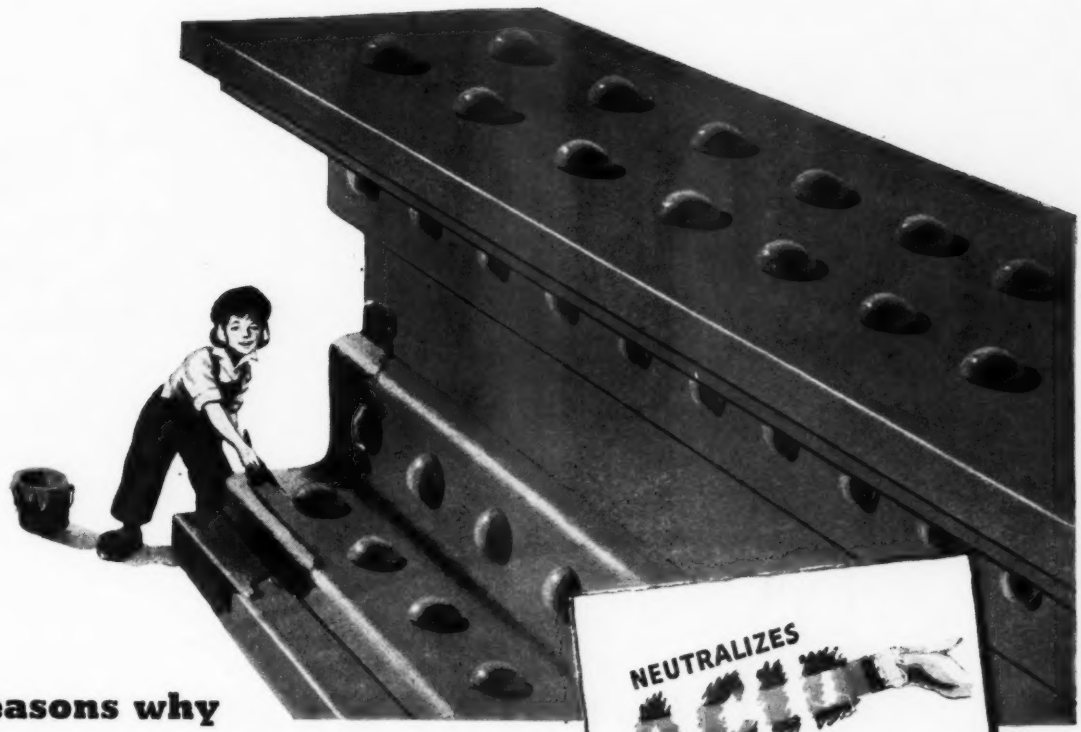
Please send me complete design data for TECO CLAMPING PLATES.

Name.....

RR..... Title.....

Address.....

City..... State.....



2 Reasons why

RED LEAD

means Extra Rust Protection . . .

Why is Red Lead so widely accepted throughout industry as *The* metal protective paint?

Why are paints containing Red Lead so generally specified for safeguarding metal surfaces from the costly ravages of rust?

The reasons are many, but none are more noteworthy than Red Lead's ability to counteract acid conditions and to halt electrochemical action—both prime causes of rusting—as explained at right.

Still another important advantage of Red Lead is that it partially combines with the usual vehicles to form compounds generally known as "lead soaps." Due to their composition and the individual way in which these compounds form, the film obtained is highly water-resistant. In addition, lead soaps contribute to the formation of tough, elastic films that "stick on the job."

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify Red Lead for ALL Metal Paints

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used. However its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better metal paint if it contains Red Lead.

NEUTRALIZES ACID

1 Red Lead has the ability to counteract acid conditions which are recognized as accelerators of rust. Structural steel is exposed to such environments because acid forming compounds are carried by the atmosphere in the form of gas, smoke and moisture. Red Lead has a neutralizing effect on these conditions as it is essentially a *basic* pigment with the ability to develop and maintain, for a prolonged time, a mild alkaline environment at the surface of the metal. Authoritative tests show that, as a result, Red Lead inhibits the process of corrosion. In short, metal paints, too, should "stay on the alkaline side."

2 Another outstanding reason Red Lead means *extra* rust protection is the unique way it shields metal surfaces with a protective film. Rusting is fundamentally an electrochemical process in which weak currents are generated which cause iron to become soluble in the lowest state of oxidation. Red Lead has properties through which this iron is rapidly converted to a stable compound that forms an adherent film. The formation of this protective shield halts electrochemical action, thus preventing further corrosion.

Write for New Booklet

"*Red Lead in Corrosion Resistant Paints*" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior metal protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

* * *

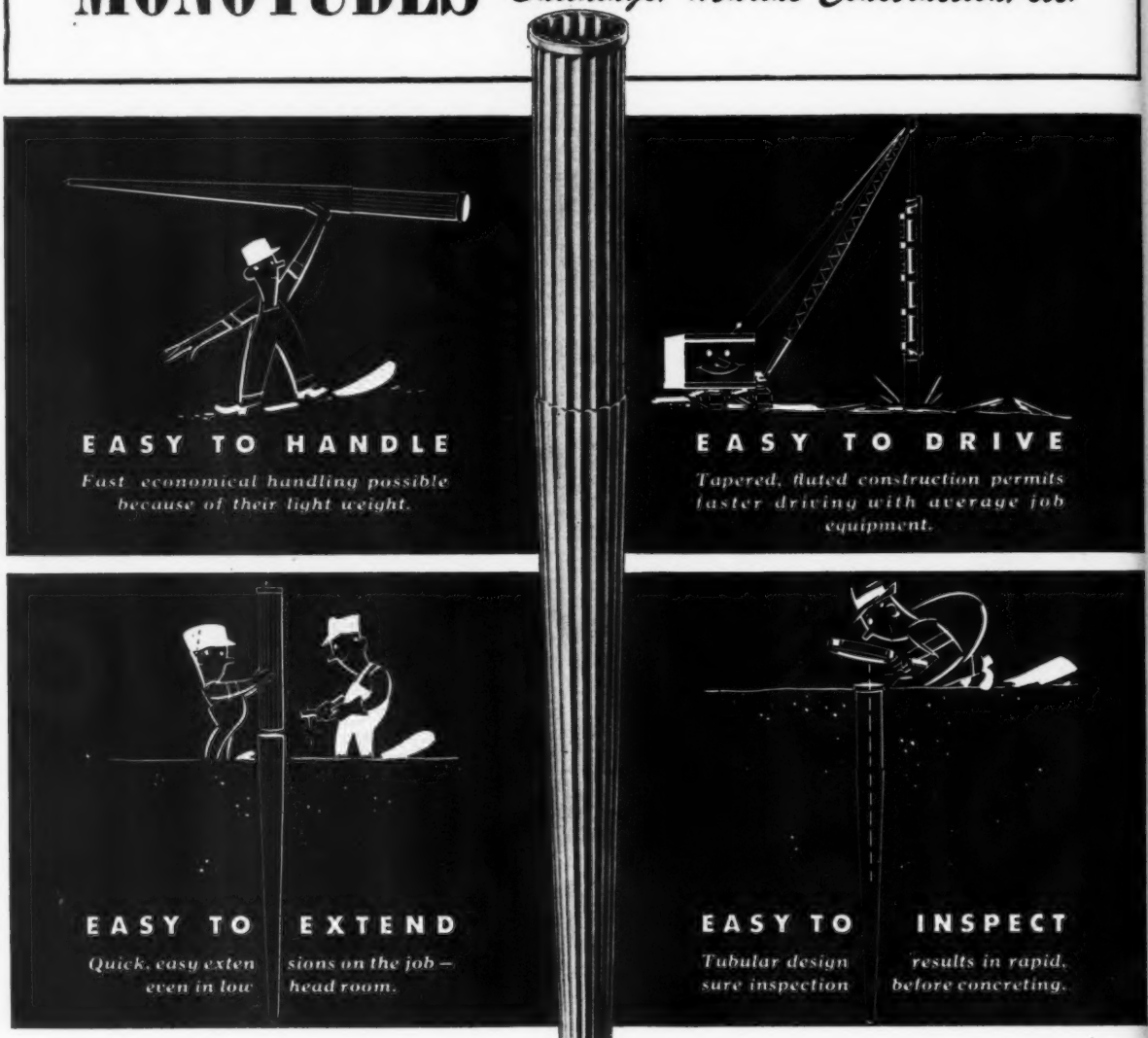
The benefit of our extensive experience with metal paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 10, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.)

DUTCH BOY RED LEAD

MONOTUBES

For Highway and Railroad Bridges, Buildings, Marine Construction, etc.



EASY TO HANDLE

Fast economical handling possible because of their light weight.

EASY TO DRIVE

Tapered, fluted construction permits faster driving with average job equipment.

EASY TO EXTEND

Quick, easy extensions on the job — even in low head room.

EASY TO INSPECT

Tubular design results in rapid, sure inspection before concreting.

THESE special advantages of Monotube tapered piles have made them time and money-savers on many jobs — large and small—all over the country. If *light weight* plus *strength* plus *fast-driving* plus *integrity* will help you—specify Monotubes the next time you install piled foundations. Available in gauge, size and taper to meet varied requirements. Write The Union Metal Manufacturing Company, Canton 5, Ohio, for free catalog and complete details.

UNION METAL

Monotube Tapered Piles

DIAMOND G MULTI-CLAMP

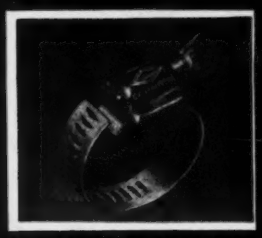
The Clamp of a thousand uses...

Here's a new clamp that meets the needs of many industries . . . a clamp that solves scores of problems quickly and economically!

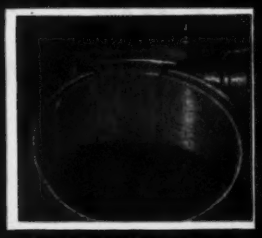
The new Diamond G MULTI-CLAMP instantly FITS and HOLDS rubber hosing, metal pipe, tubing, cables and other equipment in a vise-like grip. No wrench, no screw-driver, no disassembling necessary. The patented worm-type self-locking screw assures uniform instant adjustment. Each standard MULTI-CLAMP covers a wide range of sizes and adjustments. Continuous "gear-action" solid band prevents leakage or unequal pressure at any point!

The Diamond G MULTI-CLAMP is corrosive-resistant and meets current Army-Navy specifications. It can be used repeatedly and is practically indestructible. Mechanically held and securely welded . . . a double safety feature! For special purposes, various types of inserts, extra wide bands of metal, plastic or rubber are available.

See the MULTI-CLAMP in action . . . for automotive, aviation, railroad, marine, electrical, hydraulic, pneumatic, electronic, household use and general plant applications. Sample on request.



Easy to install—no disassembling

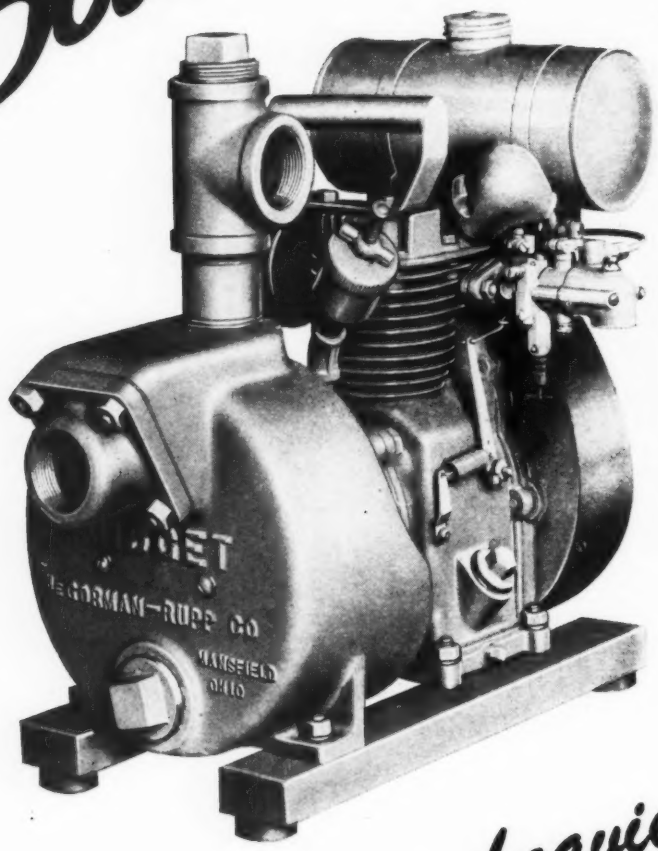


Double Safety Feature—mechanically held and welded

GEORGE K. GARRETT CO., INC.
1421 CHESTNUT STREET, PHILADELPHIA 2, PA.

DIAMOND G PRODUCTS

3000 gallons per hour



and no bigger or heavier than a tool kit

WHAT DO YOU WANT IN A PUMP?

PORTABILITY?

– There's a Gorman-Rupp pump no bigger or heavier than a tool kit that will deliver 3,000 gallons per hour.

RUGGEDNESS?

-- It's not uncommon for a Gorman-Rupp to run 60 days or more without interruption.

CAPACITY?

– You can get Gorman-Rupp pumps up to ratings of 125,000 gallons per hour.

RELIABILITY?

-- You can't clog a Gorman-Rupp with any muck or solid that will pass the intake.

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-- All Gorman-Rupp pumps are full automatic self-priming. Start the motor and you start the water.

EFFICIENCY?

-- By actual test it has been demonstrated that Gorman-Rupp pumps have not been equalled in pumping capacity for power or size. They are streamlined inside, where streamlining counts.

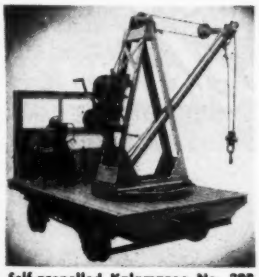
Ask what you want of a Gorman-Rupp pump – you will get more for your dollar, for a longer period of time.

GORMAN-RUPP PUMPS
UNSURPASSED FOR PUMPING FAST
ARMY NAVY

THE GORMAN-RUPP COMPANY

MANSFIELD • OHIO

KALAMAZOO "4" Derrick Car

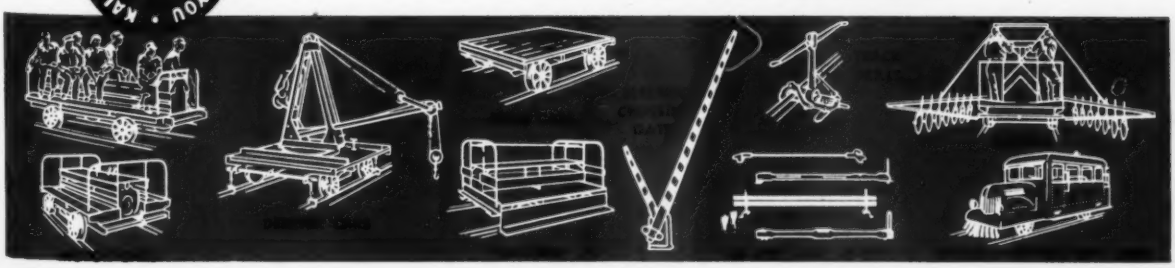


Self-propelled Kalamazoo No. 398 Bridge Gang Motor Derrick Car.

Step up your construction and repair work with this sturdy Derrick car. The efficiency and safety of this car has been greatly increased with 8 foot boom, 360° roller swivel base, hand operated rail clamps, extension lift handles and easily operated two-speed winch. It lifts up to 3,500 lbs. on any side of car. Special steel frame and extra wide platform provides for transportation of materials. Derrick removes easily allowing car to be used for other work. The Kalamazoo "4" Derrick Car is ideal for bridge and section gangs for handling heavy timbers and rails. Send for bulletin.

KALAMAZOO MEANS SERVICE TO YOU

Kalamazoo Manufacturing Company, Kalamazoo Railway Supply Divison, Kalamazoo 24F, Michigan, U.S.A.



No. 201 of a Series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION
105 WEST ADAMS ST.
CHICAGO 3, ILL.

Subject: "Well Done"

August 15, 1945

Dear Readers:

World War II has come to an end. Unbounded joy, the world over, resounds in my ears even as I write this letter. In that jubilation, those who have served most are entitled to rejoice most, and it is with that thought in mind that I address you, to tell you that your joy, born of a job well done, should be full and overflowing.

As the bells toll out Victory, I do not overlook those first in our hearts and minds—those who fought and died, those who were wounded, and those who still stand in jeopardy that this day might come. To them, who include thousands who left your own ranks to serve in every theater of operation—some of whom will never return—we owe a debt of gratitude beyond the power of words to express.

But beyond these heroes of war, we of the staff of Railway Engineering and Maintenance want to pay tribute to another group —where tribute is abundantly due—to you railroad men who have stayed loyally by your jobs, and, without fanfare or glory, have sweated out the war on the home front with untiring devotion to make sure that the supply lines of our fighting forces would not falter or fail. With your fellow officers and employees in other departments, you have done that job. You made it possible for the railroads to rebound from the greatest depression in history, to meet successfully the unprecedented peak demands of the war period.

You fought the war with your hearts as well as your hands. Tirelessly, with a sense of responsibility and devotion equaled by those in few, if any other, industries, you have stuck by your task—have fought an uphill fight in the face of insufficient materials, insufficient work equipment and insufficient man-power. Ingenuity, fortitude and determination have been your bulwarks in overcoming seemingly insurmountable problems. You have kept faith with the high traditions of railroad men throughout the years—you have met the challenge—you have "Kept 'em Rolling."

Our country is indeed fortunate in its railroads—in its railroad men. We of the staff of Maintenance are proud to have been associated with you in your labors, and, with the dawn of Peace, are impelled to record this tribute to you for your part in bringing that Peace to pass.

Sincerely,

Neal D. Howard
Editor.

NDH:jb

Is there a new discovery that bans rust from steel?

OF COURSE the protection of steel against rust is not new. But a discovery that *bans* rust from steel—years longer than ever before possible—that is news indeed!

Yes, there *is* such a discovery. It is CORRONIZING, a phenomenal new alloy "armor" for steel that may soon bring you washing machines, automobiles, water heaters, tools, dozens of steel products with up to *4 times longer life* than any you've ever owned!

The reason? CORRONIZING can defy every possible source of corrosion and *outlast any other rust-protective coating known to man!* This has been proved by hundreds of scientific tests and actual use in the war, in every kind of climate.

Soon America's more progressive manufacturers and retailers will be able to bring you products with the sensational advantages of "Corronized" steel. Motor car makers—always in the forefront of progress—may be among the first to bring you CORRONIZING, in the new model cars.

Rust robs Americans of a billion dollars annually. Thanks to CORRONIZING, you will be able to foil the robber rust...get up to *4 times the service for your money* in the wonderful new products made of steel.

Standard Steel Spring Co.

ORIGINATORS OF

CORRONIZING

Quick Facts for Manufacturing and Sales Executives

Do not confuse CORRONIZING with other metal coatings. This patented process provides a permanent alloy "armor" with 5 layers of defense against corrosion! It becomes part of the steel base . . . can be worked in any manner. Permits using lighter materials by prolonging steel's period of greatest strength. Write for samples and complete information.

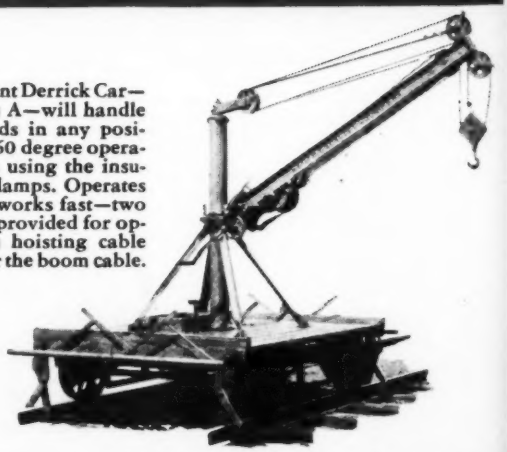
STANDARD STEEL SPRING COMPANY
CORAOPOLIS, PENNSYLVANIA

"Burns" Snow as Well as Weeds!

Fairmont WEED BURNERS
WORK SUMMER AND WINTER

The photograph above, made last winter, shows a Fairmont Weed Burner melting snow at a switch.

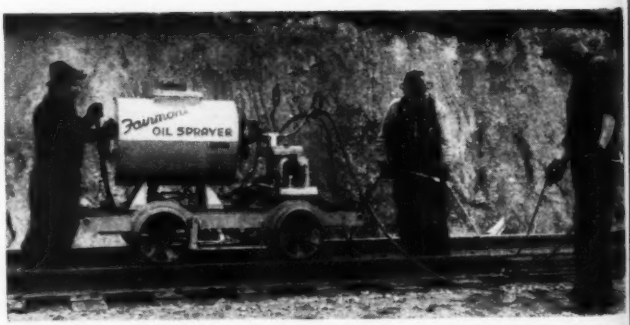
After the summer's work destroying weeds, many railroads overhaul their Fairmont Weed Burners and adapt them for winter work—snow melting. Maintenance men advise that one Fairmont Weed Burner accomplishes as much snow removal as 60 to 100 men with brooms.



The Fairmont Derrick Car—W60 Series A—will handle 3000 pounds in any position (full 360 degree operation) when using the insulated rail clamps. Operates easily and works fast—two speeds are provided for operating the hoisting cable and also for the boom cable.

Performance ON THE JOB COUNTS

Photograph at the right shows the Fairmont Oil Spray Car—W61 Series A. This equipment heats the lubricant and provides pressure oiling for rail joints, switches, etc. Three section men with the Fairmont Oil Spray Car can cover one mile an hour and oil both sides of the angle bars. The unit provides capacity for a day's work and can be removed from the track at crossings or set-offs.



Fairmont Work Equipment includes: Weed Burners, Extinguisher Cars, Weed Mowers, Ballast Drainage Power Units, Discers, Derrick Cars, Oil Spray Cars and High-Speed Spot Boards. Send for specifications and complete information.

FAIRMONT RAILWAY MOTORS, INC.
FAIRMONT, MINN.

Railway Engineering and Maintenance

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September, 1945

Railway Engineering and Maintenance

What Now?

Will the Fixed Properties Keep Pace?

August 14 marked a turning point for the railroads. With the surrender of Japan on that date, the long-awaited, long-talked-about postwar era was ushered in. Since the coming of V-J Day, the difficult problems of war have been giving way to the difficult problems of peace. The railroads have already felt the impact—they will feel it progressively more—there is no escape. Will they measure up to these new problems as they measured up so masterfully to those presented by the war? The answer is largely in their hands. They will, if they attack them with the same vision, forthrightness and determination that they displayed in solving their war-time problems. Half-way measures will not do.

While the major reconversion problem of most war industries will be to revert to former products for which there is a huge pent-up demand, the major problem of the railways in the days ahead will be to revolutionize an existing product—their only product—rail transportation, and thereby create a huge peace-time market to replace war demands. And this must be done in the face of competition, the like of which may well startle the imagination.

Most railway operating, traffic and mechanical officers are aware of what lies ahead in this respect and are planning to meet the challenge with new light-weight passenger and freight train equipment, improved power, higher speeds, faster overall schedules and better service generally. Much equipment to this end is already on order; more will be ordered promptly and progressively as conditions permit. What have railway engineering and maintenance officers to offer to meet this challenge? Will they have the same vision as to what will be required in the way of a modern track structure, modern passenger stations and modern, well-equipped locomotive and train-servicing facilities, to enable the railways to perform the kind of service visualized, with the economy that *must* be achieved?

Admittedly, there have been marked developments in track and building standards over the last decade, but what maintenance officer will say that he has been in a position to take advantage of all of these developments? What maintenance officer will agree that the ultimate in rail section and metallurgy, or perfection in any other element of the track structure, has been attained? Who will say that, in the interest of higher speeds, maximum riding comfort and safety, minimum wear and tear on equipment and the lowest possible routine track maintenance costs, he has no curve-reduction or track stabilization work to be done?

At the same time, where is the maintenance officer who will concede that the passenger stations and other public facilities generally on his road are fully in keeping with what will be expected—even demanded—in the era of competitive streamlined transportation ahead? And how many of them will contend that, in the face of the marked transition planned or under way in locomotives and cars, their roads are adequately equipped to service, maintain and repair this equipment with the greatest speed, effectiveness and economy?

For most roads, and especially those which plan to initiate or expand streamlined passenger train service and high-speed freight service, there can be no let-down in standards or programs of improvements and maintenance. On the contrary, standards must continue to be raised and programs of putting them into effect must be expanded. If the railroads fail to meet the challenge in this regard, the equipment of the future will outstrip the fixed properties—will be greatly handicapped by these properties—and their plans to meet the competition ahead will be in serious jeopardy.

Post-War Supervision—

Must Produce Higher Levels of Efficiency

RECENTLY, a high-ranking railway maintenance officer expressed the opinion that many of the men promoted to supervisory positions during the war will need to experience a radical reorientation of their thinking following the war, because so large a part of their experience had been gained during a period when maintenance money was plentiful, and when the exigencies of the moment required that many classes of work be done, almost regardless of the cost. In view of the early crack-up of Japan, this observation was more timely than was realized when expressed, for the post-war period of which he spoke is already at hand.

In thus commenting on a future situation, the maintenance officer in question was not being critical. He was merely pointing out that many younger supervisory officers, having been schooled under conditions that will not prevail in the post-war years, will, of necessity, need to adjust their thinking to the new conditions that will prevail, requiring that efficiency and economy be given major consideration in the performance of every type of work. He admitted readily that under the war conditions then prevailing, which saw the track forces hampered by inexperienced, and often inefficient, workmen, inadequate power tools and equipment, and in many cases insufficient man-power to organize efficient operations with the equipment available, it had been physically impossible to achieve a level of efficiency per man-hour comparable to that attained prior to the war. He conceded, likewise, that often it had been necessary to "get the work done, regardless of expense," to meet urgent war demands on the track or for special facilities. Today, he would concede, no doubt, that these conditions still prevail, at least in part, and may continue to for some months to come, but at the time he was maintaining, and, no doubt, would continue to maintain now, that such conditions cannot be permitted to obtain in the post-war era one day longer than is absolutely necessary.

Fortunately, the problems presented by the conditions mentioned will tend to solve themselves as a better class of labor becomes available and as former railway men return from military service to take up their old jobs. Adequate, stabilized gangs will also prove an important factor, as will the more extensive and effective use of existing types of work equipment. But to speed reconversion in work performance to a high degree of efficiency, the wise road will go beyond these normal factors and will seek out new, efficient gang organizations and new and improved types of power tools and machines, and will make the most effective use of modern methods of employee and supervisor training, including motion pictures, which have been brought to such a high degree of effectiveness in industry.

In the reversion to peace-time railroading, when economy will be a dominant factor in every item of work undertaken, supervisory officers must prepare themselves to take the lead. The selection of employees, the application of training programs, the organization of forces, and the efficient use of work equipment will be chiefly their responsibility. They will be the key men in the track forces, and the character of the work accomplished by these forces, and the return realized by the railroads on each maintenance dollar, will depend, more than ever before, upon their ability.

Glass Blocks—

Have Wide Range of Usefulness

WITH the elimination of war-time control over construction materials, and with the labor prospect more favorable than it has been for at least four years, the railways are preparing to undertake a large amount of needed work that has been deferred because of the impossibility of obtaining either materials or labor. Among these many pressing projects is the repair and modernization of a multitude of buildings that have been neglected seriously for 15 years, ranging in size from relatively small stations to enginehouses and large shop buildings.

However, the relaxation of controls over materials does not mean that all of those materials that have always been considered essential to building work will be plentiful for, temporarily at least, some of them may be almost as difficult to obtain as they were during the period of strictest control. Fortunately, during the period while railway building construction and maintenance have been so nearly dormant, numerous materials have been developed that are equal or superior to those that heretofore have been classed as essential, and can be substituted readily for them.

In the past, one of the difficult problems encountered in connection with railway buildings has been the provision of adequate window areas in shops and enginehouses. In general, these windows occupy a large part of the total wall area for the purpose of admitting as much natural light as possible. For this reason, ordinary wood sash is not suitable for these buildings, particularly for shops, because of its inability to withstand wind pressure successfully, unless the members are so heavy that they cut off much of the desired light. Steel sash, until recently the only substitute for wood sash, is attacked vigorously by the corrosive gases that are abundant around shops and enginehouses, so that its service life is either relatively short or its maintenance cost is high.

One of the materials, glass blocks, that was developed during the time when railway building activity was virtually suspended, can be used successfully as a substitute for either steel or wooden sash, with results that are entirely satisfactory. They have received wide acceptance in industry where the lighting problems are similar to those in enginehouses and shops, and it may be expected that they will receive similar acceptance in the railway field. They are easier to keep clean in the unfavorable conditions that generally surround enginehouses, power houses and shops. They require practically no maintenance; they are satisfactory from the standpoint of light admittance; they reduce the impact of outside noises; and they reduce heat losses because they have low heat conductivity.

They are fully as well suited for use in station, office

and other buildings that require more pleasing architectural treatment than is usually employed for shops and enginehouses. In fact, they have been used to decided advantage from the architectural standpoint in some of the few stations that were built or remodeled in the years immediately preceding the war. Obviously, glass blocks can be misused, as other materials are sometimes misused, but when applied as they should be, they seem to be one of those rare materials that possess no drawbacks.

Failures—

Why Not Give Them Wider Publicity?

IN railway engineering and maintenance work, as well as in other lines of endeavor, the trail of progress in the development of improved methods, procedures and devices is strewn with failures, in the form of undertakings that for one reason or another were found wanting in some important respect. This is in the nature of things. In the first place, man is not infallible and for this reason alone occasional mistakes and failures are inevitable. Second, many undertakings in railway maintenance work do not lend themselves to exact analysis in advance, with the result that resort must frequently be had to the "cut and try" method, a procedure that often involves one or more failures before success is achieved.

If the matter of failures is viewed from the perspective of this analysis, it is apparent that a failure is not necessarily something to be ashamed of, unless, of course, it can be traced definitely to carelessness or negligence. Actually, however, it is a deeply-ingrained trait of human nature to "cover up" failures and to keep them from the knowledge of other persons. In a way, this is extremely unfortunate. Whenever a failure occurs valuable knowledge is acquired that can be used to govern future procedure, but under the policy of suppressing information regarding failures, the benefit of the knowledge gained through them is lost to all but those persons immediately involved. This means, of course, that the same failure may occur repeatedly at different times and places before the knowledge conveyed by it becomes generally known, with what unnecessary loss in time, effort and money can only be conjectured.

Recently, a committee chairman of one of the railroad associations, in soliciting members of his committee for information on the subject assigned, stated that examples of failures are just as important as descriptions of successful work, and that some failures should be described in the report to illustrate the need for thorough preparation of the work. If this attitude were more general, it is certain that the attendant wider dissemination of information regarding failures, and the reason for their occurrence, would be conducive to a higher rate of progress with less effort and waste motion.

It is human nature to seek approbation by talking or writing freely of successes achieved—and this is the principal means by which useful information gains circulation. It is not the purpose here to belittle this source and character of knowledge, but simply to suggest that progress might be accelerated considerably if failures were discussed with equal freedom.

Winter Coming—

But Fears Are Allayed with New Machines

LATE summer, with its generally warm days giving no hint of the winter storms only a few months away in many parts of the country, may seem to the layman hardly an appropriate time to be discussing snow and ice disposal at railroad terminals. But those who have the responsibility of keeping such terminals operating smoothly in all kinds of weather have learned by harsh experience that it is too late to make plans when the snow drifts of the first blizzard are beginning to accumulate on tracks, switches, platforms and driveways and the operating department is calling for help.

That is why, even though the "dog days" are barely behind us, we are presenting in this issue a detailed description of the preparations for dealing with winter problems that have been made by the St. Paul Union Depot Company. Indications are that the railroads are making substantial progress in perfecting a highly-effective technique for disposing of snow and ice at terminals, heretofore the most vulnerable parts of the railroad plant during snow storms. In the development of this technique an important element has been the introduction and wide application of switch heaters of various types, including the adaptation of weed burners to snow-melting service. Another factor has been the increasing use of bulldozers, tractor-operated plows, loading equipment of various types, and even scrape-wagons of the carryall type for handling snow from platforms and driveways.

A particularly difficult phase of the problem has been that of developing satisfactory and economical means of disposing of snow and ice accumulating on station tracks at passenger terminals, but persistency and inventive genius are also prevailing here. Not long ago—in the December, 1944, issue to be exact—this magazine published a description of a track-mounted snow loader and melter that the Boston & Maine was using with highly satisfactory results at its North Station at Boston. Now comes the St. Paul Union Depot Company with a new snow and ice loader for use primarily in keeping station and yard tracks open to traffic. This machine, combined with a car-mounted snow melter for keeping switches open, has proven so effective that the officers of this company profess no longer to be dismayed at the approach of winter. Using this equipment they are confident of their ability to handle without difficulty practically any situation that is likely to arise.

Taking these latest developments into consideration, it is apparent that highly effective mechanized methods are now available for dealing with practically every phase of the snow-fighting problem at terminals. This is indeed a fortunate circumstance, considering what is ahead for the railroads. In the first place, the prospects for competition being what they are, it will be more important than ever to eliminate traffic delays from any cause. Second, with war-time experiences fresh in mind, the prudent policy would seem to be one that envisages the mechanization of snow-fighting organizations to the highest extent possible, rather than to assume that there will always be an inexhaustible reservoir of casual labor to draw from when the snow begins to fly—an assumption that can have painful consequences as many a maintenance man will testify in no uncertain language.

"Where Do We Go From Here?"

The Maintenance Man

The coming of peace has opened the door to a new era in transportation in which the success attained by the railroads will be dependent to a considerable extent on the degree of economy and effectiveness with which their fixed properties are brought up to the necessary standards and are maintained to these standards. Being keenly appreciative of this fact and of the nature of the burden that they will be asked to carry, maintenance men as a group are convinced that many problems and changes are in store for them. The probabilities in this respect are discussed in the accompanying article, which is based on expressions of opinions obtained from a group of top-ranking maintenance officers.

WITH THE spirit of victory still fresh in their minds, railway maintenance officers are turning questioning eyes to the future. Never before have they looked forward with so much interest and speculation, for it is recognized universally among them that a new epoch is being entered which will be characterized by far-reaching changes in every phase of their work—changes that will have the effect of confronting them with new and perplexing problems that will be at least as difficult, and possibly more so, than those encountered during the war or the depression period that preceded it.

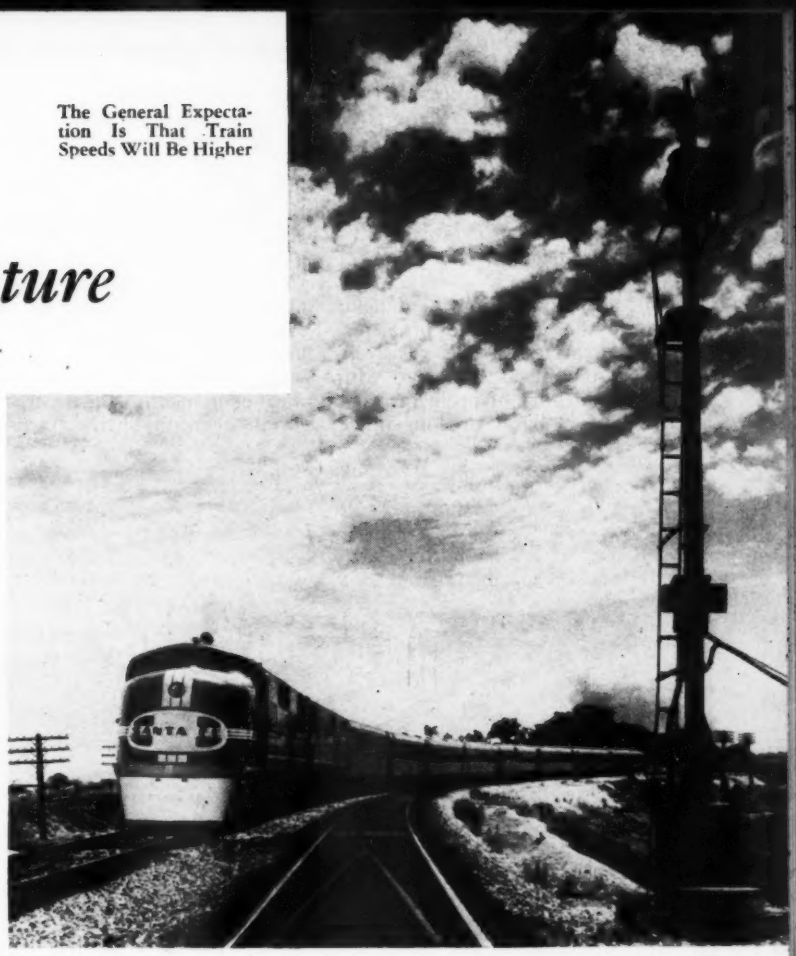
Appraising the Problem

Since the first step in the solution of any problem is to appraise it from every angle with the thought of obtaining at least an approximate idea of the character it will take, maintenance men everywhere are endeavoring to visualize the future in terms of what it will mean to them in discharging the responsibilities that have been entrusted to them. What about train speeds, for instance? Presumably they will be faster, but how much? What effect will these higher speeds have on the standards to which railway tracks and other structures must be constructed and maintained? What will be the situation with respect to labor, materials and equipment, especially in the months immediately ahead? Assuming that increased mechanization of maintenance forces will be an important factor in holding down maintenance costs, what types of equipment will be in greatest demand, and what additional types of machines will be needed? What developments in rail can be looked for? In other materials? Are the present types of maintenance organizations adequate for the future, or are changes in order? To what extent are the properties suffering from deferred maintenance, and how is it going to be restored?

All these problems, and many others, present themselves in rapid succession as the maintenance man contemplates the future. Unfortunately, the complete and final answers are hidden by the fog that shrouds coming events. However, since there are always in existence certain fundamental trends that afford an approximate guide to future developments, it is logical to assume that a broad outline of the shape of things to come can be obtained by canvassing the leaders in a particular field regarding their interpretation of these basic trends and what can be done to solve the problems presented by them.

Putting this thought into action, a number of top-ranking maintenance and engineering officers were requested by this magazine to participate in a study designed to throw as much light as is possible at the present time on the many questions and problems facing these men and their associates. In this study, which might be likened somewhat to a round-table discussion, expressions of opinion, many of them of a detailed nature, were obtained regarding a wide range of subjects dealing with every phase of railway engineering and maintenance work. In this particular article only those phases of the study pertaining to gen-

Will Present-Day Standards of Track Construction Be Adequate for Future Requirements?



The General Expectation Is That Train Speeds Will Be Higher

Looks at the Future

eral developments in the maintenance field and to the track structure are discussed. The results of the study as they relate to developments and needs in the building, bridge and water service fields are being reserved for presentation in later issues.

Two Categories

For purposes of discussion, the many questions that are now confronting the maintenance and engineering departments may be classified into two groups, namely, (1) those that have presented themselves for immediate attention, largely as a result of the end of the war, and (2) those that are more of a long-term nature, the latter being determined to a considerable extent, either directly or indirectly, by the things that the railroads will have to do to compete successfully with other forms of transportation.

In discussing the immediate situation, the officers questioned evinced a considerable degree of uncertainty regarding the trend of events over the next few weeks or months, and particularly with respect to the availability of labor, materials and equipment. When asked to state the nature of the most important single problem confronting them at the moment, most of them answered promptly and emphatically with the one word, "labor." Every indication points to the fact that maintenance activity is being maintained at a high level, and that some railroads are planning to continue this high rate through the winter months, insofar as possible, in an effort to catch up on deferred maintenance. For this reason their labor requirements will remain at a correspondingly high level. However, indications so far are that workers released from war plants have as yet indicated little or no desire to accept employment in railway maintenance work, especially on the track. The concensus is that this situation will prevail at least for some months before any considerable improvement can be hoped for, and that, in the meantime, a continuing man-power shortage can be expected.

As of the present time there is also considerable uncertainty regarding the ability of the railroads to secure many needed materials and units of work equipment. While it is generally expected that the situation in this respect will show rapid improvement, the prospects regarding a number of important items are such as to cause some concern. One of these is rail. During the war the railroads were unable to obtain a sufficient amount of rail to replace that which was being worn out by the record load of traffic being carried, and for this reason many of them plan to undertake extensive rail-laying programs as quickly as possible. This being the case, there is some concern that ensuing months may see the demand for rail such that the rail mills will not find it possible to make deliveries as promptly as they will be desired.

Deferred Maintenance

Also in the category of immediate problems is that of catching up on deferred maintenance. Judging by the expressions of those questioned, the amount of under-maintenance varies widely between different lines. A few roads assert that they have little or none, but the majority report that their properties show at least some deferred maintenance, with a considerable number saying it is present in substantial amounts. The item that seems to have suffered most in this respect is rail, the replies indicating that on nearly all roads the rail is suffering from inadequate replacements in amounts ranging from moderate to substantial. Crossties do not appear to have suffered much in this respect, although, due to the recent substantial slump in tie production, it seems highly probable that the railroads as a whole will not be able to fill their requirements for ties in 1946, thereby producing a paradoxical situation in which a decline in general tie conditions will be occurring long after the war has ended.

A number of railroads report that practically all items or classes of the fixed properties are effected by deferred maintenance, including rail, ties, ballast, bridges, buildings and water service facilities, while on others only one or several of these items seem to have been affected. Almost universally, the roads report that they are far behind in general track surfacing. Regardless of the extent to which the properties are suffering

from deferred maintenance as a result of war conditions, there is in evidence a universal desire to restore them to adequate standards of upkeep as quickly as the labor and materials to do so can be obtained.

The Basic Problems

While not under-rating the difficult nature of the immediate problems, they are expected to be relatively simple of solution as compared with the second category of problems, that is, those of a basic or long-range nature arising largely from fundamental issues affecting the transportation field. These problems may be resolved into the proposition that, because of the higher speeds that will be required for both passenger and freight trains, the track structure, especially on high-speed main lines, will have to be maintained to higher standards of line, gage, cross-level, stability, durability and permanence than ever before, and that this will have to be accomplished with maximum economy.

Many Changes

In attaining this state of affairs, it is expected by the majority of those questioned that many changes and improvements in construction standards and in maintenance practices will be placed in effect. To summarize them, the more important of these changes include a trend to longer crossties up to 9 ft. in length; a similar trend regarding rail length and an increase in the practice of welding rails end to end; the more extensive use of crushed stone ballast, or its equivalent, with adequate programs for keeping it in a clean, free-draining condition; the more general adoption of all available means for stabilizing the roadbed, including more effective surface drainage, further installations of sub-drainage systems, the increasing use of pressure grouting, pole driving and related expedients; further large-scale curve-reduction projects to permit higher train speeds, many of which projects will be carried out by company forces using modern grading equipment of various types; the more intensive use of mechanized methods in maintenance work, including a marked trend toward equipment of the off-track type; certain revisions in the track-maintenance organization, including a trend toward the use of large gangs operating from central points, with motor trucks to transport the men to and from work; and many other refinements and improvements in practices, materials and equipment wherever advantages in the form of better performance and lower over-all costs can be obtained.

A Great Deal of Curve Reduction Remains to be Done in Preparation for Higher Speeds

Basis of Information

The foregoing summary is based on expressions of opinion obtained from the chief engineering and maintenance officers of 19 railroads in the United States and Canada regarding a total of 20 questions, 11 of them dealing with broad general subjects, while 9 were concerned specifically with matters relating to the construction and maintenance of railroad track. The opinions obtained regarding these 20 subjects are analyzed in the following. It should be borne in mind, in reading this analysis, that its principal purpose is to present the opinions of a group of individuals regarding coming events. Admittedly, there is some conjecture involved, but since the opinions expressed were arrived at in large part by projecting into the future trends that are already in evidence, it is apparent that they should carry considerable weight in any attempt to obtain an approximate idea of what coming years will bring.

The Question of Speeds

Since the character of the track of the future, and its standard of maintenance, will be determined to a considerable extent by the speed of the trains, both passenger and freight, passing over it, those taking part in the study were requested first to state their opinions regarding the extent to which they are expecting higher train speeds. With but few exceptions the concensus is that the speeds of both passenger and freight trains must be materially increased, especially on those roads or lines where there has as yet been no marked trend in this direction, if the railroads are to compete successfully with other modern forms of transportation. The majority opinion seems to be that, where not totally impracticable, maintenance men must prepare their tracks to accommodate maximum passenger train speeds of about 90 m.p.h., although in several instances the opinion was expressed that speeds considerably higher than this are conceivable. One chief engineer expects that the speeds of streamlined Diesel-electric trains will be as high as 110 to 120 m.p.h., while another thinks that a speed of 125 m.p.h. will be "practical and comfortable on tangents and light curves, if the equipment is properly designed and maintained," although he is doubtful if this speed will be attained very often. It is significant that the chief engineer of a road on which passenger trains are now being operated at speeds greater than on most other lines was among those who predicted that train speeds will go still higher.

Another significant reaction obtained is that the majority of those questioned look for materially higher freight train speeds, ranging up to 65 m.p.h., with one chief engineer mentioning "the possibility that freight schedules may approximate those of present-day secondary passenger trains." In regard to both passenger and freight trains there is a general disposition to expect that, along with higher speeds as a means of reducing over-all schedules, steps should and will be taken to speed up the movements of freight trains through terminals and to reduce the standing time of passenger trains at stations. An interesting observation made by several officers is that, before materially higher train speeds can be placed in effect, certain improvements must take place in the design and

maintenance of rolling stock, especially freight cars. One chief engineer stated that before extremely high speeds can be permitted the equipment must be improved and maintained to a very high standard, while another holds to the opinion that higher speeds for both passenger and freight trains can be obtained by improving the design of equipment, without increasing the standard of roadway maintenance.

Curve Realinement

Notwithstanding the considerable amount of curve-reduction work that has already been carried out on lines carrying high-speed trains, it is apparent that large amounts of additional work of this nature is planned for the immediate future. One chief engineer said that plans are being made on his road to reduce the curves on about 500 miles of line, another foresees "immediate improvement on about 20 per cent of our heavy-traffic main line," while another said that it would be necessary to lighten about 40 curves in high-speed territory on his road.

The chief engineer of one road that already operates a large fleet of high-speed streamlined trains stated that, if such service is extended to other routes, a great deal of additional curve-reduction work will be necessary, while another stated that "to permit higher speeds we would have to revise the alinement on a very considerable proportion of our road." This latter statement was seconded by still another chief engineering officer, who added that "grade and curve reduction is sometimes economical regardless of a general increase in train speeds." The replies from several roads indicated that much of their main-line mileage is already built to suitable standards of curvature and that any remaining undesirable curves are usually located in rugged country where the cost of curve-reduction work is considered prohibitive. On several roads that are predominently freight lines, it was indicated that, while no curve realinement work is contemplated, it is planned to carry out extensive programs of grade reduction.

How to Do It?

Answers to a question relating to the manner in which the various roads plan to carry out their curve-reduction programs indicated that there is a trend toward the use of company-owned off-track types of modern grading equipment for this work. Several roads indicated that, while they had already acquired considerable amounts of equipment of this type, additional machines would be obtained as needed, while the chief engineer of another line stated that he prefers to carry out the realinement work with company forces and that, while ample on-track equipment is available for this purpose, the advantages of off-track equipment are so great that as soon as such equipment becomes available it is proposed to obtain quantities of it.

On a number of additional lines it is planned to perform curve-reduction work both by contract and by company forces, using the former method for the larger jobs and the latter for relatively small projects and miscellaneous construction jobs involving grading. Some companies plan to continue the practice, at least for the time being, of contracting heavy grading projects. However, regardless of the methods to be employed for carrying out such work, the implication was plain that, due to the availability of mechanized grading equipment capable of moving large volumes of material at low unit costs, the question of yardage as a factor in determining whether a particular project is economically justified will not be nearly as great as in former years. Aside from its use in carrying out curve-reduction and other improvement projects requiring grading, modern off-track grading equipment, already in wide use for routine work such as cleaning, widening and deepening ditches, building up embankments, smoothing the right-of-way, and related tasks, is expected to come into much wider use for such application in the future.

Are They Good Enough?

Regarding the effects that higher train speeds will have on maintenance standards and practices, there was a general disposition on the part of the chief maintenance officers of those roads whose tracks are already maintained to high standards, to feel that present maintenance standards and practices will generally be adequate for the future, except that they will have to be extended to additional territories as required by traffic conditions. However, there is a considerable segment of opinion which holds that standards still higher than those now prevailing will be required. As one chief engineer put it, "higher train speeds will naturally require higher maintenance standards, and to obtain them will necessitate (a) closer or more intensive supervision and inspection, and (b) the performance of many of the things that we have known should be done, but have not always performed because they were not always imperative." In any event, the implication was general that all main track must be maintained to a high standard and that, to make this possible under the conditions that are likely to prevail in the future, maintenance men not overlook any opportunity to increase the efficiency and effectiveness of their maintenance forces.

Many Roads Are Far Behind in Their Out-of-Face Surfacing Programs

Other Exacting Demands

One of the questions presented was phrased as follows: "In what ways other than speed (such as the more intensive use of existing facilities) do you anticipate more exacting demands from operation?" The replies of those who felt there will be more exacting demands of this nature are summarized well in the words of one chief engineer who anticipates that these demands will consist "principally in eliminating possible hazards; in other words, by producing a more dependable railway, less subject to delays or interruptions." Several of those replying to this question mentioned the need for eliminating slow orders, with one chief engineer stating that it would be necessary to permit higher

allowable speeds on unavoidable slow orders.

One chief engineer implied emphatically that the more exacting demands anticipated from operation should be met, at least in part, by improved equipment and faster handling at terminals. For instance, to obtain faster and more dependable train service, it is not always necessary, in his opinion, "to go about it by the expensive method of increasing the standard of track maintenance to permit higher train speeds." "It is wasteful economy," he said, "to run a train as fast as it can turn a wheel between 100-mile division points and then sacrifice the time gained by requiring from one to two hours for servicing and inspecting the engine." His remedy for this situation is to reduce to a minimum the time for fueling and watering locomotives at terminals, to "require the physical condition of a locomotive to be such that it can be run for at least 1,000 miles without stopping," and to limit the weight of the train so that the locomotive can make the over-all speed permitted by the track structure.

Abuse from Equipment

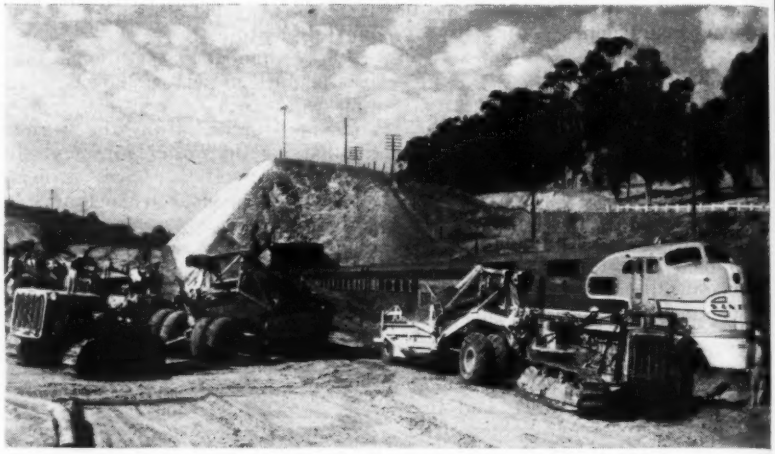
A rather surprisingly wide range of opinions were expressed regarding a question concerning the extent to which tracks and structures are now subjected to unnecessary abuse resulting from improper locomotive counterbalance and other defects in the design of equipment. Several of those participating in the discussion indicated that they were experiencing little or no difficulty from this source, but the majority reported that at least some trouble was being encountered, with some commenting at considerable length regarding the difficulties being experienced.

Generally speaking, these difficulties fall naturally into three classifications, including (1) the operation of locomotives, with reciprocating parts, at speeds higher than those for which they were designed; (2) the operation of freight cars with trucks and wheels that are felt to be so designed as to result in unnecessary abuse of the track; and (3) the operation of locomotives and cars that are not being maintained to suitable or prescribed standards. To a considerable extent the replies in this respect are summarized by the statement of one chief engineer who said: "Tracks and structures are now subjected to unnecessary abuse due to the high dynamic augment of locomotive reciprocating parts, the operation of many heavily loaded cars with flat wheels, and the lack of resiliency in transferring the loads to the wheels. Improvements in the design of equipment and better inspection and maintenance will give relief."

Some relief from the damaging effects of locomotives and freight cars is hoped for through the use of lightweight materials in their construction, and through a return to higher standards of maintenance, which is expected to take place with the eventual amelioration of the labor shortage in mechanical departments. One chief engineer stated that "while it would be difficult to prove," he is convinced that present trucks and wheels abuse the track unnecessarily and that "a real high-speed truck with proper springs and probably steel wheels is essential to high-speed operation." Several expressed the view that the wider use of Diesel-electric locomotives for both passenger and freight service will be a considerable factor in reducing or eliminating difficulties caused by damage inflicted on the track structure by some existing power.

Work Equipment

Another of the questions dealt with the extent to which the use of work equipment would be affected by faster train schedules and increased utilization of track and other facilities. An analysis of the answers to this question indicates that a still more decided trend toward the use of off-track equipment is in the offing. In fact, all but one or two of those replying to this question stated that there would be greater need for off-track maintenance equipment in the future, either for specific types of work or for maintenance work in general. Contrasting with this majority opinion is that of one chief engineer who stated that "the use of centralized train control has, in many instances, provided means for releasing track from operation for sufficient periods to permit work to be done with on-track equipment and, I believe, it is possible with further installations that the use of on-track equipment will be practicable." Another officer, after stating that his road planned to take advantage of any new types of equipment that are made available for on-track or off-track work, expressed the view that there are "a great many types of construction and maintenance of way work that cannot be handled successfully or profitably with off-track equipment."



Modern Off-Track Grading Equipment Is Finding Wide Application in Railroad Work

New Machines Needed

Speaking of specific types of equipment, several of those participating in the discussion mentioned the need for a machine designed to clean the ballast in the cribs between the ties. As one man put it, there is need "for the development of a machine or machines, which will remove, clean and reapply rock ballast, not only in the shoulders and the inner-track spaces, but in the cribs and under the ties." Another officer expressed a desire for an effective off-track machine for laying rail. Turning to existing types of equipment, specific mention was made by one or more of the participants of their need for such types of off-track machines as crawler pile drivers, draglines, bulldozers, and other grading equipment, crawler-mounted compressors, motor trucks, and mowing machines. Underlying this phase of the discussion was the implied conviction that a high degree of mechanization of the maintenance forces, utilizing both on-track and off-track equipment, will be a continuing necessity in the post-war period as a means of reducing maintenance costs to a minimum.

With reference to the organization of the track forces, the majority of those participating in the study do not anticipate that there will be any important departure from the present basic organization of section and extra or floating gangs for track maintenance, although several of those replying took sharp issue with this opinion. For instance, one maintenance officer is convinced that the use of small section gangs with limited territories "will probably be discontinued except for certain yard and terminal gangs." "Fully mechanized floating or extra gangs," he said, "will be utilized to put up or rehabilitate tracks at longer intervals of time, with any work needed in between these periods done by small gangs covering a much longer territory. Inspection will be made frequently by a track inspector riding over territory in a light motor car."

Taking the contrary view, a chief engineer expects that the "extra gang for track maintenance, housed in cars, will never get back to its former importance." This engineering officer, who is in charge of maintenance on his road, anticipates that longer sections will be the rule, with centralized housing, and that there will be considerable improvement in housing and sanitation for track employees.

More Motor Trucks

With further regard to the housing of track workers, and to the matter of transporting them, there is a considerable segment of thought which holds that motor trucks will come into wider use for carrying such workers to and from work, the implication being, as in the case mentioned above, that this practice will permit the track forces grouped in large gangs to be housed at central points. The majority of those commenting on methods of housing the track forces are convinced that there will not be many changes in present methods, considering that on many roads housing practices have already been brought to a fairly high state of development. However, the chief engineer of one road, on which floating gangs are now housed in old cars, expects that it should be possible to improve conditions by obtaining portable houses that can be readily moved over highways from one location to another. A somewhat similar view was expressed by another officer who feels that there will be more extensive use of labor camps, both permanent and portable.

Answers to a question dealing with the development in construction and maintenance materials to be expected from war-time progress in metallurgy produced a range of opinions. Some stated merely that they expected certain refinements in maintenance materials to develop from such progress. Others indicated that they were uncertain as to what to expect in this regard, but that they would welcome any improvements, while still others were more specific and detailed in their predictions. Some of the things that are hoped for from war-time developments in metallurgy include frogs, switches and crossings of greater durability; track fastenings with increased strength and durability; a reduction in the weight of maintenance machines to permit them to be handled more readily; and possibly the use of low-alloy steel for rail.

Expects Big Developments

The most enthusiastic reply received to the question on war-time developments was from a chief engineer who said: "There is no doubt but that there will be a very decided evolution in construction and maintenance materials as the result of war-time progress, and no doubt we will be given the opportunity of using synthetics and plastics, as well as improved metals, which will go far toward reducing costs through such means as extended life and lessened maintenance requirements."

In one question expressions of opinion were requested regarding whether it was anticipated that first cost will assume larger or smaller importance in comparison with the costs of maintenance. The majority of the replies to this question directly took the position that first cost would be of smaller importance in the future, the reason, either expressed or implied, being that maintenance costs would have to be watched more closely because of the higher wage levels that are expected to prevail. However, several officers took the position that first cost will assume larger importance, while others merely stated, in effect, that the answer to this question could only be determined by careful study of the conditions surrounding each individual project.

Among the questions dealing specifically with track matters, the first one requested expressions of opinion regarding whether the present track structure as a whole is considered adequate for post-war traffic demands. The answers to this question were almost unanimously in the affirmative, although frequently they were qualified in various ways. These qualifications are summed up very well in the reply of one officer who stated that the present track structure is adequate for post-war traffic demands, "providing that track is built and maintained to existing highest standards for the class of traffic expected." Deviating somewhat from the majority opinion, one chief engineer expressed the view that, while the present track structures are probably adequate for post-war traffic insofar as their ability to carry the loads is concerned, it is doubtful whether many of them are capable of carrying the higher speeds economically in view of the rapidity with which existing types of materials are worn out.

Dependence for Controlling Costs Will Be Placed in a High Degree of Mechanization

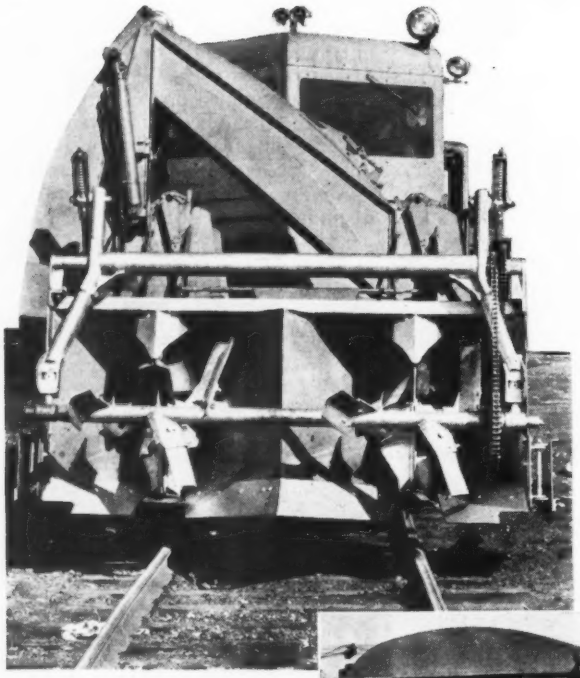
Rail Considered Adequate

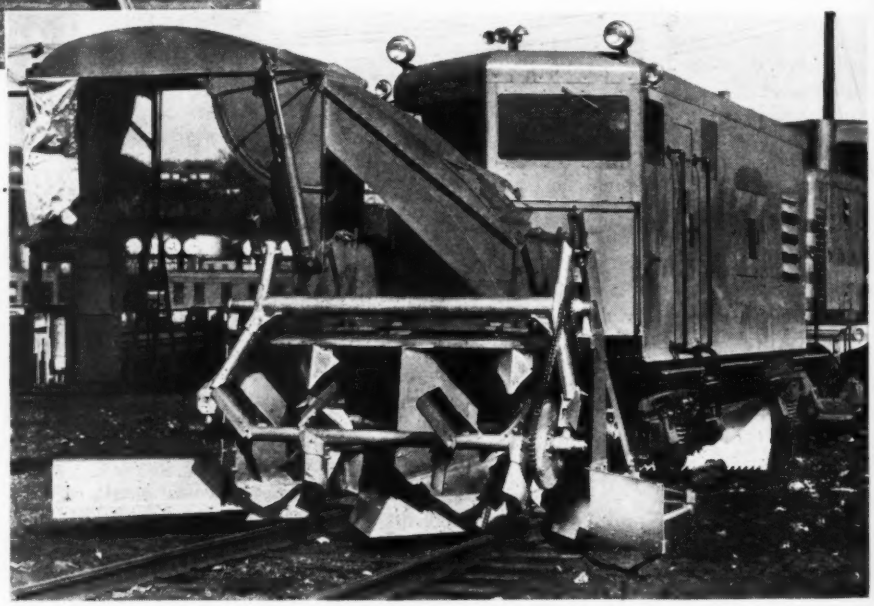
Generally affirmative answers were also received regarding a question as to whether present-day rail is considered adequate to meet the demands of post-war traffic, although most replies indicated that, as time goes by, improvements are expected to take place in rail sections and in rail steel. The prevailing view in this respect was given expression in the reply of one officer who stated that current investigations show that possibly slight re-

(Continued on page 873)

St. Paul Union Is All Set

The St. Paul Union Depot Company, which for many years has experienced serious difficulty in removing snow and ice from its 23-track passenger station layout at St. Paul, is convinced that, with a last-season developed snow and ice loader, and a car-mounted snow melter to keep switches open, it is ready for whatever the coming winter will bring. This article tells of the problem at the station property and describes in detail the design and method of operation of the two snow and ice removal units.





Above—Front-end View of the Snow Plow-Loader Showing the Plow and Ice Flanger in Raised Positions, and the Loading Chute Extension Lowered in the Clear. Right—A Three-Quarter View of the Sno-Flyr Snow Plow in Operating Position, Showing Such Parts as the Plow Nose, Gathering Wings, Raker Bar and Discharge Chute

FOR the first time in many winters, officers and employees of the St. Paul Union Depot Company, operating the Union Passenger Terminal at St. Paul, Minn., look forward to a winter in which they will be prepared to cope successfully with whatever may come in the way of snow or ice, regardless of any shortage in manpower. No longer do they anticipate sleepless nights wondering what the morrow will bring—whether snow will block trains, or whether men will be available to clear tracks and switches. And these have been matters of real concern in the past, especially the formation of ice between and outside the rails of station tracks, which, yearly, between December and March, has required thousands of man-hours for its removal.

Much of this confidence is born of a new snow and ice loader, purchased late last winter for clearing the track, which supplements a car-mounted snow melter, which has proved highly effective at the terminal for many years in keeping single and slip switches clean and operative under even the most severe conditions. Knowing what the snow melter will do, greater optimism arises from the availability of the new snow and ice loader, which was operated sufficiently last winter to demonstrate its practicability and effectiveness, especially in ripping out ice from between and adjacent to the track rails and loading it on cars for disposal. In fact, on one occasion last winter, the machine flanged the ice from 11,000 lin. ft. of 11 station tracks and loaded a part of it in 4 hours, work which, on the basis of previous experience, would have required a crew of 12 men eleven 10-hour days to complete with picks and shovels.

The St. Paul Union Depot property involves a layout of 23 tracks directly back of the station building, all but two of which, which are freight tracks, are served by umbrella-type train sheds between alternate pairs of tracks, affording protection to approximately 13,400 lin. ft. of low-level concrete platforms. This layout extends in a generally east and west direction, and, except for eight of the passenger tracks nearest the station building, which are stubbed at their west ends, all of the tracks are through, with a throat of ten tracks at the east end and one of seven tracks at the west end. The entire terminal property extends over approximately 4,000 ft. from end to end, and includes a total

Passenger Terminal for Winter

of 13.02 miles of tracks, with 39 double-slip switches and about 90 simple turnouts.

The roads using the station facilities include the Northern Pacific, the Great Northern, the Chicago, Milwaukee, St. Paul & Pacific, the Chicago, Burlington & Quincy, the Chicago & North Western, the Minneapolis, St. Paul & Sault Ste. Marie, and the Chicago Great Western, which, together, operate as many as 336 trains into and out of the terminal each 24-hour period. With such an intensity of movements, not including the almost continuous movement during certain hours of two switchers, on a total of 21 passenger tracks, the threat of a winter tie-up by snow or ice was a matter of serious concern to these railroads using the terminal facilities and to the Depot Company.

Severe Ice Problem

St. Paul lies in a territory of erratic winters insofar as snowfall is concerned, but it invariably has long spells of below-freezing and sub-zero weather. Thus, while heavy snow storms are relatively infrequent, the formation of ice between and alongside the rails of most of the station tracks, caused both by the accumulation of surface water and drippings from standing cars and locomotives has presented an annual, winter-long problem. Year after year in the past, the only practicable means of removing this ice has been by hand labor with picks, loading it on flat cars by means of hand shovels.

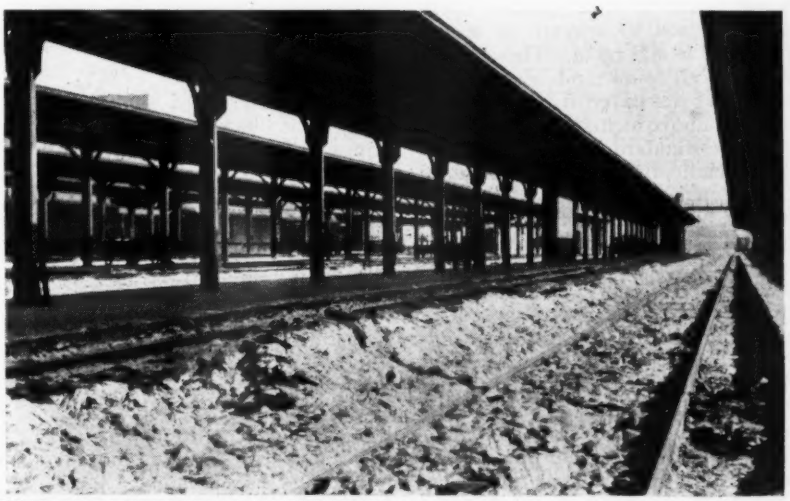
For the most part, keeping the ice below the tops of the rails has required the constant employment of 12 men and a foreman, and on at least a few occasions large extra forces have had to be employed to cope with the situation. On one of these occasions, a total of 70 men was employed for 90 hours to clean up the ice situation, and on another, in 1943, as many as 120 high school boys were employed at one time solely for ice removal work around the station.

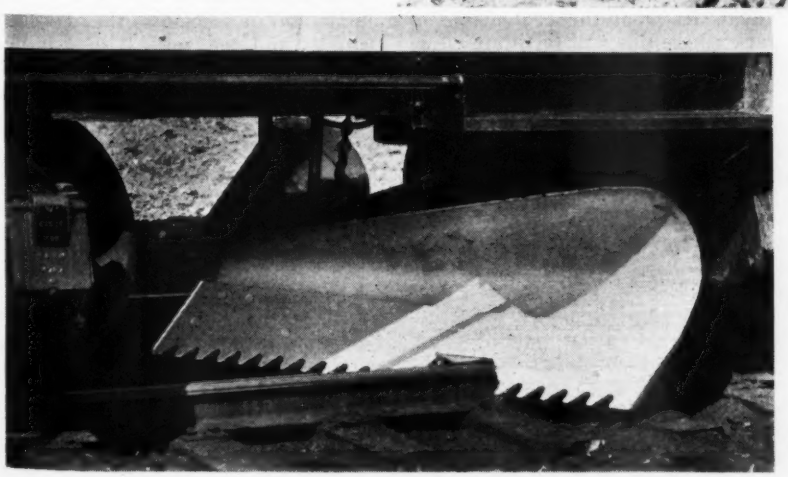
Keeping switches at the terminal clear of snow had been done through the use of an oven-type, track-mounted oil burning unit, which will be described later. This same oil burner had been tried in desperation to melt ice between the rails of the station tracks, but with unsatisfactory results, and even the use of air-operated paving breakers, with special ice-cutting bars, had to be given up during recent winters because of the difficulty of securing men who were young and strong enough to operate them in an effective and satisfactory manner.

New Machine Developed

Confronted with this situation, the vice-president and general manager of the Depot Company approached a local equipment builder for a flange-wheel-mounted model of a highway-type snow loader which it was supplying to the War Department, largely for war plant, military highway and air-field snow clearing work. Then, working with the builder, a design was developed which it is expected will not only cope successfully with any snow conditions which may be encountered at the terminal, but which has already demonstrated that it will solve the ice removal problem, and in only a fraction of the time and at only a fraction of the cost of hand-pick and shovel methods.

The new snow loader, which is known as the Sno-Flyr rotary plow,





Right—General View Through a Part of the Station Area at the Terminal, Showing the Severity of Ice Conditions to Be Contended with During a Large Part of the Winter. Below—A Close-Up View of the Ice Flangers in Operating Position.

is a car-mounted unit, the car frame carrying a fully enclosed engine and operator's cab, and supporting the entire plow mechanism at its front end; power connection between the engines and the plow mechanism being by means of a sturdy drive shaft, equipped with suitable universal joints. The over-all length of the unit from rear coupler to front of plow is 35 ft., the over-all width 9 ft. 7⅜ in., and the over-all height, above top of rail, 12 ft. The ice cutting arrangement, in the form of a wedge-shaped scarifier-flanger, is mounted about midway between the car trucks, which are spaced 14 ft. center to center.

Throws Snow 125 Ft.

Considering first the plow and loading unit at the front end, this consists essentially of a nose-type plow, with gathering side wings, which, together, feed snow and loosened ice back to two 10-in. wide vertical slots in the plow face, one directly over each track rail. Operating within each of these slots is a multiplevane rotor, the two rotors being mounted on a common shaft, and designed to operate at speeds from 300 to 400 r.p.m. These rotors displace all snow and ice fed into them and discharge it out openings directly above at high velocity.

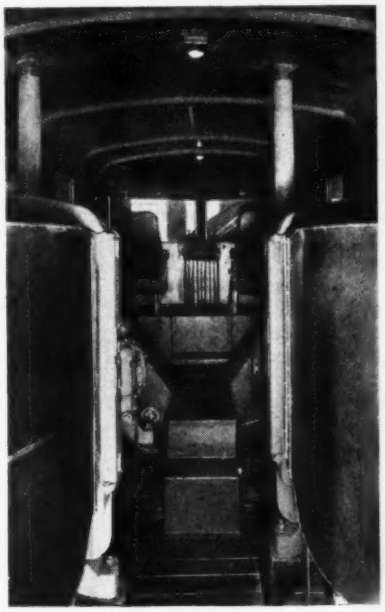
In the standard off-track model of the machine, the discharged material is deflected to each side of the unit in two broad arcs entirely clear of the roadway, up to distances exceeding 125 ft., if desired. In the unit developed for the Depot Company, to meet the conditions imposed by the side loading of cars on an adjacent track, a different arrangement is employed, in which the right-hand rotor (facing the front end of the machine) discharges its load of material upward and laterally to the left at high velocity over the underside of a fixed, curved metal chute, at the upper end of which is a pivoted section, which directs the flow of material out to the side at the angle desired. At the same time, the material discharged from the left-hand rotor moves upward and laterally to the left at high velocity to the outer end of the fixed chute, where it joins the flow of material discharged from the right-hand rotor.

The pivoted chute extension, which has a concave downward face, and an over-all length of 8 ft. 3 in., can be raised or lowered through an arc of approximately 90 deg., from a near vertical position close to the side of the plow, in the clear, when not in use, to a maximum position upward of about 15 deg. above the horizontal. Through this range, in combination with the controlled speed of the rotors, and thus the velocity with which the material is discharged, the material can be thrown wide of the machine, over adjacent tracks, up to a distance of 125 ft., or it can be deposited directly on flat cars on an immediately adjacent track. When used to load cars, which is one of the principal uses to be made of the unit at the terminal, a canvas apron will be attached to the outer end of the pivoted chute section to help direct the discharged material downward to the car deck.

Special Features

Other features of the plow arrangement include the gathering wings on opposite sides, which, together, afford a maximum normal plow spread of 14 ft., or 7 ft. each side of the center line of track; provision for raising and lowering the entire plow assembly from a point 12½ in. above top of rail to a point 3 in. below top of rail; and lateral adjustment of the entire plow assembly 12 in. to each side, affording a maximum reach of 8 ft. from the center line of track to one side or the other as conditions may make desirable to produce the most effective results, or minimum clearance of only 6 ft. from the center line of track where this will facilitate clearing intertrack obstructions.

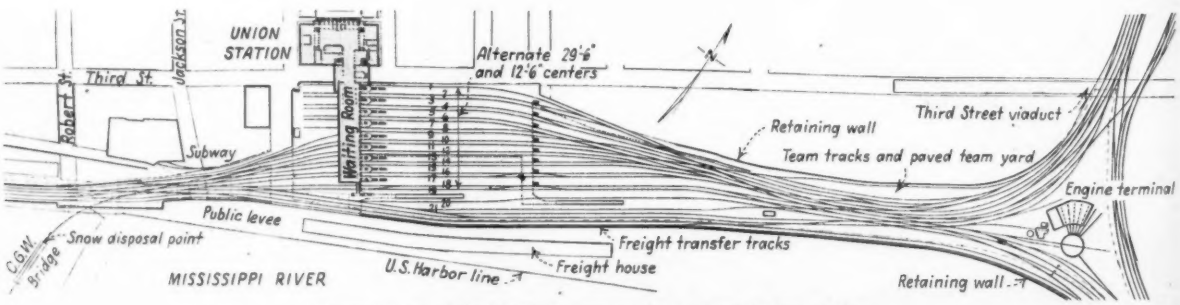
Still another feature of the plow is a rotating raker bar that extends out in front of the plow itself, which, revolving at a speed of approximately 60 r.p.m., breaks up any large particles of snow and ice encountered and feeds them back to the rotors. This bar, mounting four specially-shaped and sloped paddles toward each end, directly in the paths of the rotors, can be raised and lowered through an arc, from a point where its paddles just clear the tops of rails, to a point where the tops of the paddles lie a distance of approximately 7½ ft. above the top of rail. This latter



General Interior View of the Cab of the Snow Plow-Loader, Showing the Hydraulic Control Levers Up Ahead

feature makes the machine particularly effective in breaking down drifts when plowing deep snow.

All of the plow attachments or functions mentioned, including the pivoted chute extension, the vertical and lateral movement of the plow assembly, and the vertical movement of the raker bar, are hydraulically controlled from the front of the op-



General Plan of the Track Layout at the St. Paul Union Station

erator's cab. The single exception is the movement of the flared gathering wings, which are braced outward or pulled in manually, as desired.

Power for the operation of the two rotors and raker bar, as well as hydraulic pressure for the operation of the various other parts of the unit, is furnished by two 6-cylinder, 100-hp., Minneapolis-Moline gasoline engines, housed within and on opposite sides of the plow cab. These engines are to be used singly or together as required, depending upon snow and ice conditions, the speed at which removal is desired, and the distance it is required to throw the material.

Ice Cutter

The ice cutting and flanging feature of the plow assembly, and the one that will find greatest use at the St. Paul terminal, is entirely independent of the front and loading and disposal unit already described. This, in general, consists of two heavy curved steel blades flared back from a common point in the center of the track. The special features of these blades include a series of sharp cutting teeth along their bottom edges, their hydraulic operation from a point 3¾ in. below the top of rail to clearance of 5¾ in. above the top of rail, and their length and flare, which removes the ice to points approximately in line with the ends of the track ties and piles it at three points for subsequent removal by the front-end plow assembly in a second pass of the machine.

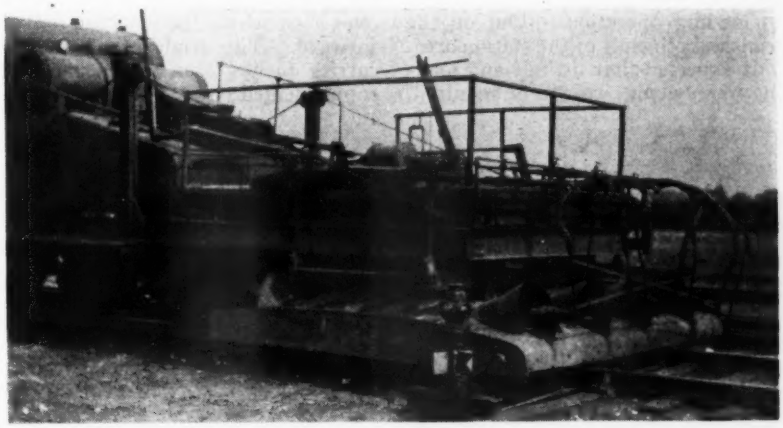
Non-self propelled, the plow car will be moved about the terminal by the six-wheel steam locomotive employed there in switching operations, while the plow itself will be operated by a crew of two men in the cab, supplemented by a foreman on the ground, who will direct operations and warn of obstructions. Of the two men on the plow, one, the operator, will handle all controls, while the other will be engaged mainly in watching operations and relaying signals from the foreman.

Based on a knowledge of its special conditions and on its limited experience to date with the new plow, the St. Paul terminal has definite plans for operating the machine during the coming winter, depending only upon the severity of snow and ice conditions that will be encountered. Through the station tracks proper, both snow and ice will be cleared from one track at a time, loading directly onto a string of six flat cars on the adjacent track between platforms. Thus operated, it will also load out any snow that may have fallen onto the platforms themselves, since this snow will have previously been plowed into the track space by means of the wheel-tractor plows which the company uses for this purpose.

Since the loading plow loads only to the right side as it moves forward, it will be operated on the south track of each pair between platforms when moving westward through the station area, loading onto cars on the north track of each pair, and will then be turned on the terminal turntable and used to clear the remaining tracks, operating eastward on the north track of each pair between platforms, while loading onto cars on the adjacent south track between platforms. Obviously, a wide range of flexibility will have to enter into any loading schedule to meet track occupancy conditions, but experience indicates that pairs of tracks will be available for this work throughout most of any day, with periods of light movement when nearly all tracks can be cleared.

The six coupled flat cars to be used in the snow and ice removal work will be spotted by the six-wheel steam switcher to be used to push the plow car. Operating on the adjacent track, the practice will be first to rip out the ice and snow between and outside the rails to the ends of the ties, piling the material in windrows just beyond the ends of the scarifier blades, and then to back up and, with the plow lowered and operating, to pick up all of the loosened material and load it on the adjacent cars.

In the loading operation, the string of flat cars will be pulled along with the plow by means of a cable extending between the switch engine and the cars. When that part of the deck of the flat car directly opposite the loader has been filled, the cable hitch to the cars will be changed to bring the loader opposite an empty area on the car being loaded. Repeated, this operation will continue until the entire string of cars has been loaded, following which the switch engine will move the plow into the clear and then pull the loaded cars to the point of disposal.



The Large Oven-Type Melter Used at the Terminal to Clear the Snow and Ice from Switches

At St. Paul, this point of disposal will be, as in the past, the single-track bridge of the Chicago Great Western over the Mississippi river, immediately west of the station area. Here, employing a rubber-tired tractor equipped with a reversible angle dozer, the ice and snow will be pushed off into the river, first from one side of the cars and then from the other, operating continuously over steel plates connecting the car decks. Unloading is expected to require only about 20 min., releasing the cars for reloading.

Late delivery of the equipment last winter limited the amount of work done with it in that winter, but such work as was done demonstrated that it was not only effective in removing the ice to a smooth plane about 3 in. below the top of the rail, including any large chunks of ice dropped from cars or piles of ice accumulated from drippings, which were readily broken up by the rake and rotor paddles and loaded as readily as chipped ice.

Speed of Operation

The speed of operation in both the ripping and loading operations will be about four miles an hour, and, on the basis of performance last winter, it is expected that even the longest tracks at the station can be cleared of ice and snow in a matter of 10 to 15 min., depending upon interferences with operations, such as water, steam and electrical outlets

between tracks, which may require the raising and lowering of the plow, shifting it laterally, and adjustment of the gathering wings.

With careful operation and control of the equipment, experience has shown that there will be little spillage from the flat cars during loading, but, as a precaution against injury to passengers, they will be kept off from the platform adjacent to loading operations. Out on the leads at both ends of the station area, it is expected that little if any loading of snow and ice will be required, since demonstration last winter showed that the machine will pick up and throw the material across as many as seven tracks into unoccupied areas alongside. Where it may not be desirable to make the full throw for any reason, the material can be loaded on cars as described previously, or it can be thrown across one or more tracks at a time, working progressively toward the side of ultimate disposal.

It is in this latter method of operation that it is expected machines of this type will find their greatest effectiveness in clearing freight yards. In team yards, any of the various methods of operation can be used—throwing the snow clear of the track, loading onto flat cars, or loading into highway trucks operated on adjacent driveways. Here, snow on the driveways will be pushed out onto adjacent tracks for loading or other disposal by the machine.

A Highway Model of the Sno-Flyr Cutting an 8-Ft. Opening Through a 6-Ft. Drift

Clearing Switches

As mentioned previously, the removal of snow from the many double-slip and simple turnout switches at the terminal is effected by an oven-type burner, which, experience over many winters has shown will clean up any double-slip in a matter of three to six minutes, and so warm the ground and track structure as to melt any additional falling snow for a period of about one hour.

The burner as a whole includes essentially an old 2,000-gal. engine tender, supporting by a truss arrangement an open-bottom oven at its front end, 11 ft. wide by 12 ft. long, which is raised and lowered over a switch as the machine moves forward. The tender tank, which carries fuel oil for the burners, is supplemented by a 1300-gal. fuel tank on top, and is moved about the terminal by means of the same six-wheel steam switcher that will be used to handle the snow plow.

Eight Burners

The oven, which is dropped down directly on the rails when melting, and raised a point about five inches above the rails when being moved, houses eight torch-type oil burners, four equally spaced along the front end and four along the rear end, all burning standard Diesel fuel oil and blowing toward the center of the oven pan. Steam is furnished by the switcher to atomize certain of the burners and for driving a steam pump on the tender, and condensed air is built up in reservoirs located on the tender to atomize the remaining burners, to operate a fuel pump, and to furnish power for raising and lowering the oven.

Another feature of the machine is that the entire oven can be shifted laterally to one side or the other a distance of 18 in., as desired, to clear switch stands or other obstructions. However, when melting directly opposite a switch stand, the switch lamp and target are removed temporarily so that they will not be damaged by the burner heat.

When in operation, four men are stationed on the burner unit. One of these men controls the operation of the burner torches; two shift the oven laterally, as required; and one operates the air valves for raising and lowering the oven. On the ground, accompanying the burner, a foreman directs operations; two men remove switch lamps and targets; one man replaces the lamps and targets after the passage of the burner; and three men with shovels and brooms do such auxiliary clearing as may be required to insure the free drainage of water away from switches.

By the first of November each year, the burner has been overhauled and put in good working condition. Then, starting early with each storm, and before the snow reaches a depth of four inches, it is put in operation under a plan which best meets traffic conditions at the time, continuing from switch to switch until all of the switches are cleared.

Operation

When clearing simple switches, one lowering of the oven on the rails for a minute or two is sufficient to free the entire switch. When clearing double-slip switches, however, the oven is lowered progressively four or five times throughout the length of the switch in a series of stops and starts of the burner as a whole. Operating in this manner, it requires about five minutes to clear a double slip, while a single slip can be cleared in from two to three minutes. At this speed, all switches at the terminal can be cleared in eight to nine hours.

Operation of this unit by the terminal forces during the last 25 years has demonstrated its effectiveness, and the only serious difficulty that has ever been encountered has been with the water produced. However, with the installation of a large number of catch basins throughout the terminal area during the last three years, in conjunction with a system of subdrainage and storm sewers, this problem has been practically overcome, it now being sufficient for the trackmen accompanying the burner to open up short waterways to the catch basins to insure adequate drainage.

Supervision

Snow and ice control problems at the terminal are under the general direction of C. S. Christoffer, vice-president and general manager of the St. Paul Union Depot Company.

who was responsible for the development and purchase of the flange-wheel mounted snow-plow loader. Actual snow and ice removal operations at the terminal are under the immediate supervision of N. F. Podas, chief engineer of the Depot Company. The Sno-Flyr plow was built by the Wm. Bros Boiler & Mfg. Company, Minneapolis, Minn.

"Where Do We Go From Here?"

(Continued from page 867)

visions in sections may be warranted to reduce stress concentrations at critical spots, particularly in portions of the web. "Changes in metallurgy," he continued, "may be indicated to provide a harder and tougher rail, but this latter quality may be increased by some form of heat treatment."

Will Rails Be Longer?

Regarding the prospect for longer rail, the majority of opinion is that there will eventually be some increase in length. One maintenance officer expects that a length of 45 ft. or 48 ft. will become standard, while another anticipates that rail 78 ft. long will eventually come into use. Furthermore, it is anticipated generally that there will be an increased tendency toward the practice of welding rails end to end, although in a few cases it was stated that such welding is not contemplated or that, if done, it will be limited to road crossings, tunnels and other special locations. One chief engineer is of the opinion that the practice of welding rail into continuous lengths "will gain in favor as rail defects are eliminated so that long sections of welded rail may be installed without fear that it may be necessary to remove portions of them because of the presence of flaws or defects resulting from manufacture or use."

Practically without exception all those participating in the study declared that the practices of subjecting rail to a controlled-cooling process at the mill, and of hardening the ends of rails, either at the mill or in the field, have proved their merits. Nearly all of them also indicated that they expect further development and use of rail-end welding to overcome batter, but opinion was not quite so uniform regarding the practice of cropping rail. While a majority expect that there will be further extension of the practice of cropping rails, several expressed objection to this practice on various grounds. As to the method of cropping rails, the replies indicated that there is a trend toward the use of power-driven cold saws for this work.

Answering a question as to whether there is need for further refinement in the care of rail when handling, laying in the track and thereafter, more than half of those replying expressed the opinion that there was an opportunity for further improvement in this respect. Most of those holding this view agreed that the primary need is for closer supervision and better education of employees.

Longer Ties Expected

When asked if they expect to see a trend toward longer ties, the majority of those taking part in the study answered in the affirmative, the prevailing view being that ties 9 ft. long are desirable, although others took the position that a length of 8½ ft. is adequate. Regarding other expected changes in tie practices, various suggested expedients for protecting ties were mentioned, including larger tie plates with independent fastenings, better protection against checking and splitting, and possibly more effective methods of treatment. One chief engineer announced that his company had been experimenting with weather-resisting compounds for filling up surface cracks in ties and that, while this expedient is still in the experimental stage, it is anticipated that the company will eventually adopt the practice of filling up the cracks in its ties annually.

Other Means Advocated

Several chief engineers argued that the increased stability that is sought through the use of longer ties can be obtained in other ways. One of them stated that ties 8½ ft. long give sufficient distribution of load on the ballast under heavy equipment, and that "any weakness in the track structure generally will prove to be in the ballast itself, due to its being too shallow, or in the subgrade." Another, while agreeing that there will be some trend toward the use of longer ties, declared that "this method of increasing the stability of the roadway is being replaced by other methods that give greater relief, such as post driving and grouting."

When questioned regarding the adequacy of their ballast in quality and in section to give track the required stability for the traffic and speed that are visualized for the future, the majority replied generally in the affirmative, although several indicated that they were carrying out long-range programs for replacing inferior types of ballast with crushed stone or its equivalent. Several of the answers indicated a tendency to feel that it might be desirable to increase the depth of the ballast section somewhat as compared with present practice. A considerable number expressed the opinion that it would be necessary in the future to devote more attention to the problem of reconditioning ballast by adequate programs of cleaning, discing, etc.

Stabilizing the Roadbed

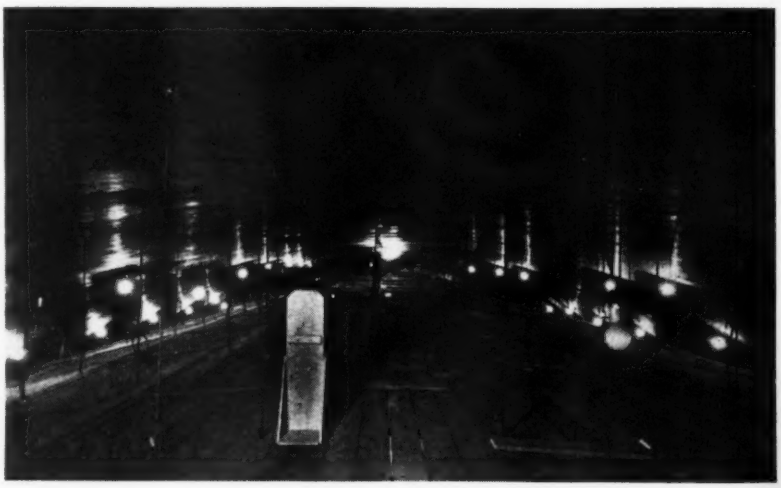
The final question among those dealing with track was one regarding whether the need was forseen for a more stable roadbed to cope with future demands, as regards width of roadway, adequacy of drainage and other factors. All of the replies to this question indicated a keen appreciation of the need for a table roadbed and a considerable number expressed the view that not only would it be necessary to continue the efforts now being made in this direction but that they would have to be intensified considerably. The spirit of these replies is summed up in the words of one chief engineer who spoke as follows:

"A stable roadbed is the foundation of satisfactory track and I anticipate greatly increased activity along this line, resulting in increased width of roadbed, both in cuts and on fills, with proper slopes to insure the stability of embankments, careful attention to drainage, both surface and subsurface, and the use of suitable vegetation on slopes to prevent erosion. I also expect that the practices of grouting, driving poles, and other methods of stabilizing roadbeds, where such extreme methods are necessary, will become more general."

Thus is a cross-section of opinion presented on future trends in maintenance of way. From this discussion it is plain that the war's end will not necessarily bring any great amelioration of the maintenance man's difficulties; rather he will have his own little problem in "reconversion" to contend with, which will be in the way of preparation for tackling the many difficult problems in every phase of his work that the future is certain to bring.

GRAND CENTRAL Gets

Left — Overhead View of the Grand Concourse, Showing the Ceiling Scaffold in Place. Below—Above the Suspended Scaffold Before the Flexboard Was Applied to the Ceiling



WHEN the Grand Central Terminal, New York, was opened in February, 1913, one of its outstanding features was the high, arched ceiling of the main concourse, which presented a symbolic view of the heavens, with stars, the Milky Way and the signs of the Zodiac. Last August, after nearly 32 years, the New York Central began the task of redecorating this ceiling. In this work the ceiling was cleaned and repaired, and then refaced with 4-ft. by 8-ft. sections of Flexboard, after which paint and gold leaf decoration were applied. The work required the erection of a very large scaffold, all of which was suspended from the ceiling without interfering with terminal operations below. In June, the ceiling scaffold was removed, and the traveling public again gazes in awe at the reproduction of the heavenly constellations, brighter and more inspiring than ever.

The main concourse of the Grand Central Terminal is 287 ft. long by 120 ft. wide, and is 125 ft. high from the floor to the center of the arched ceiling. The ceiling construction is of plaster on iron mesh, supported by angles and steel channels bolted to the arched roof trusses. It was originally decorated with water paint and gold leaf, which was applied from a scaffold supported by steel cables extending through holes in the ceiling. The ceiling holes were subsequently covered by painted metal discs pulled into place by wires after the scaffold and cables had been removed. The cables supporting the scaffold were fastened by means of eye-bolts to angles which were bolted to the roof trusses or to the roof purlins which support the ceiling. This method of suspending the scaffold was provided for in the original design so that it could be used again when it eventually became necessary to repair or redecorate the ceiling.

In the 32 years since the station was opened, dust accumulated on the ceiling, the paint faded and, because the system of ventilation employed was not thoroughly understood at first, some condensation also hastened the deterioration of the plaster and paint on certain portions of the ceiling. Constant inspections of the back side of the ceiling plaster were made from above to be sure that no unsafe condition existed, but eventually the New York Central decided to renew the paint and decoration, and at the same time make any repairs necessary. This was a large undertaking, involving expensive scaffolding, in spite of the provision made for its erection in the original construction.

To carry out this work, a contract was awarded to the same company which erected the scaffold when the ceiling was originally decorated, and the same general method was used for

New Sky and Stars

This article describes the effective method and manner in which the New York Central redecorated the expansive ceiling of the main concourse of its principal passenger station in New York, using a new Flexboard facing.

supporting the scaffold. The work of erecting the scaffold was done at night, roping off only small areas of the concourse floor each night beneath where the scaffold was being placed. All scaffolding material was taken up on the freight elevators of an adjacent office building to the roof of that building, and was then carried in through windows above the light cornice high above the floor of the concourse. Construction of the scaffold was started from this light cornice and was first built up vertically to the ceiling at the sides and ends of the room, following which it was carried across the ceiling itself. Throughout, the scaffold was constructed of Tubelox, a patented tubular steel scaffolding, with 1½-in. salt-treated planking.

The ceiling scaffold, 270 ft. by 120 ft., was hung about 5½ to 6 ft. from the ceiling face, and was supported by 600 ½-in. cables, extending through the ceiling to the tubular scaffold members below. The cables in each case were doubled-back at the ends and were secured by Crosby clips, approximately 2,400 such clips being used. In this manner the ceiling scaffold was placed section by section, the added tubular members being attached to those placed previously. As the scaffold was placed, which required a period of two months, lights were installed above it in sufficient number for illumination purposes.

After all the scaffold was in place, railroad forces cleaned off all of the dirt from the ceiling, scraped away all loose paint, and made a careful inspection of the plaster. In some places where deterioration was suspected, a number of test holes were drilled. Despite the dirt and generally poor condition of the paint, the plaster was found to be in exceptionally sound condition. In only a few places was there slight deterioration, and these were repaired.

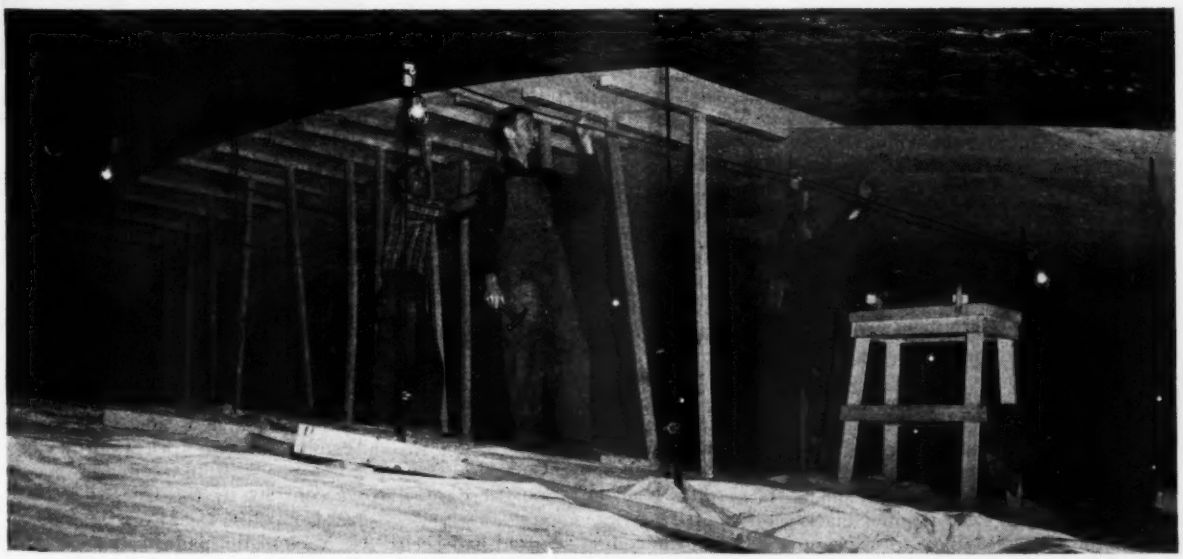
Flexboard Covering

To eliminate the possibility of future deterioration of the plaster, it was decided to cover the entire "blue-sky" section of the ceiling with Johns-Manville asbestos-cement Flexboard. This treatment was not feasible on the end wall sections which were of rough ornamental plaster. In this work, sheets of 3/16-in. Flexboard, 4 ft. by 8 ft., were cemented to the ceiling, using braces from the scaffold floor to hold them firmly in place until the cement had set. These sheets were also fastened to the ceiling by means of heavy U-shaped steel wires, which were made to extend through small holes drilled in the Flexboard and upward through the ceiling to the 1¼-in. steel angles supporting the ceiling plaster. Approximately 20 of these U-shaped wires were used to help support each 4 by 8 section of facing material.

All of the Flexboard was applied with its rough side facing downward. This side was exposed, rather than the smooth, finished surface, to provide a better bond for the paint and also to prevent any reflection from destroying the optical illusion of the sky. After the Flexboard was in place, the wires were painted with red lead, following which they, and the joint cracks between the Flexboard panels, were plastered with white lead spackle, and the ceiling was then ready to be repainted.

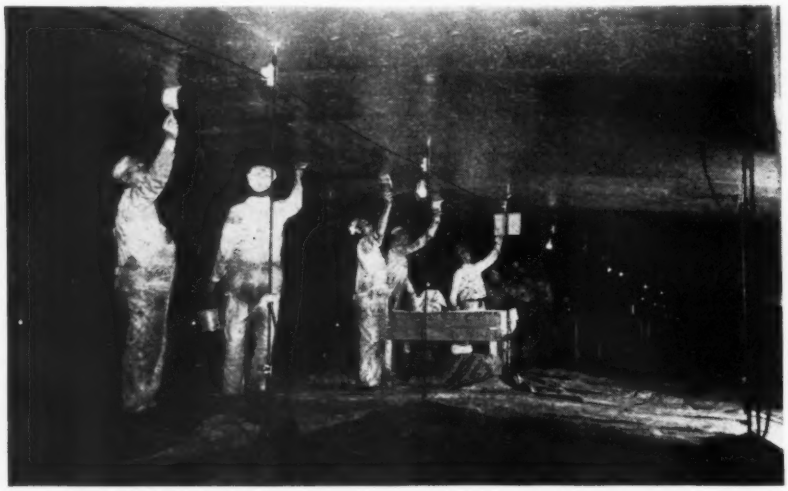
Painting

It was decided to paint the Flexboard with three coats of oil paint, and the contract for the work was awarded to a contractor who had served as foreman on the original decoration work more than 32 years previously and so was familiar with requirements. Because the surface being painted was different from the original and because oil instead of water paint was to be used, extensive experiments were conducted to be sure that a color would be obtained with



Applying New Flexboard Facing. Note the Braces Holding Panels Until the Cement Sets

a dead flat finish which would have the desired effect. Also, several panels were test-painted, and some sections of the scaffold floor were removed so that these panels could be viewed in proper perspective from the concourse floor. In addition, the National Lead Company ran accelerated ultra-violet, steam and scraping tests on the paint proposed, which showed very good results.



Putting on One of Four Coats of Oil Paint on the Ceiling

It was finally decided to apply a first coat of boiled linseed oil, a second coat of lead and oil with Patterson-Sargent Vita-Seal primer and sealer, and a third coat of lead and oil with titanium oxide, tinted a cerulean blue with a manganese pigment. When these three coats had been applied, however, a fourth coat similar to the third was also added to get the uniform depth of blue desired.

All of the paint was applied with brushes, and after the final coat, the blue was stipled with rather widely spaced daubs of various colors. This added to the depth of color when viewed from a distance. For the Milky Way, a large number of white stiples were applied fairly close together. A total of 750 gal. of paint was required for the four coats on the blue-sky ceiling and the three coats (buff) on the end sections of ornamental plaster.

Stars and Zodiac

The original decorative design of the stars and Zodiac was reproduced in gold leaf. When the terminal was built, nearly 60 stars were provided with individual lights which shone through the ceiling at night. The light from these stars passed through small mica discs which were painted black around the edges, leaving a translucent center of varying size to correspond approximately to the magnitude of the stars represented. This arrangement was unsatisfactory because the discs collected dust and the stars became dim.

To correct this condition, it was decided to let the lights shine through unobstructed ½-in. holes in the ceiling. The comparative brightness of the stars was obtained by placing a flat metal plate above each hole, between the light and the hole—the metal plate in each instance having a hole in it varying in size from ⅛ in. to ½ in. in diameter. With this arrangement, dust cannot obstruct the light, and such dust as does accumulate can be blown away if found desirable.

The stars, Zodiac and signs of certain familiar constellations were outlined on the ceiling by using perforated template sheets of paper and by marking through the perforations with charcoal, after which the decorations were applied in gold leaf. A total of 40,000 lin. ft. of ¾-in. wide gold leaf was used for this purpose.

When the painting was done, the railroad electricians removed the temporary fixed lighting above the scaffold and placed temporary drop cords through the cable holes in the ceiling, which could be removed after the scaffold was taken down. Before the scaffold was removed, the scaffold floor was completely vacuumed so no accumulated dust would drop to the floor below.

The work of removing the ceiling scaffold progressed more rapidly than the erection, and was completed in about a month. As in the erection, the removal was done at night and sections of the concourse floor were roped off.

When the ceiling scaffold had been removed, small metal discs, painted blue and attached to wires, were pulled up to cover the holes through which the cables had extended, and the wires were fastened above the ceiling. Additional sections of scaffold along the walls at the sides and ends of the concourse were erected after the ceiling scaffold was removed to permit cleaning of the walls and windows and painting of the ironwork around the windows.

Numerous safety and fire preventative measures were required. As mentioned previously, the erection and removal of the scaffold was done at night, with that part of the concourse floor directly beneath the work roped off. All scaffold plank were pressure-treated with a fire-resistant salt and the drop cloths used were also treated to make them fireproof. A "no smoking" rule was rigidly enforced. Nine carbon dioxide fire extinguishers were installed on the scaffold, this type of extinguisher being provided to prevent any drip to the floor below in case of fire. Since a considerable amount of work was done by the railroad, the railroad company carried general insurance coverage for the entire job. Only one small mishap occurred, when a part of one can of paint was spilled, and, strangely enough, the recipient of the few stray drops which fell to the concourse floor was not a patron of the railroad, but one of the employees in the building department of the terminal. The work described was done under the direction of E. B. Moorhouse, assistant terminal manager, Grand Central Terminal, New York Central, New York. The scaffold work was done under contract by the Chesebro, Whitman Company, Inc., Long Island City, N. Y., and the painting was done by Charles Gulbrandsen, New York.

Applying the Gold Paint Decoration. Note the Star in Upper Left-Hand Corner and Hole Through Which Light Shines

How a Motor Car Is Built

Part II

By G. R. WESTCOTT

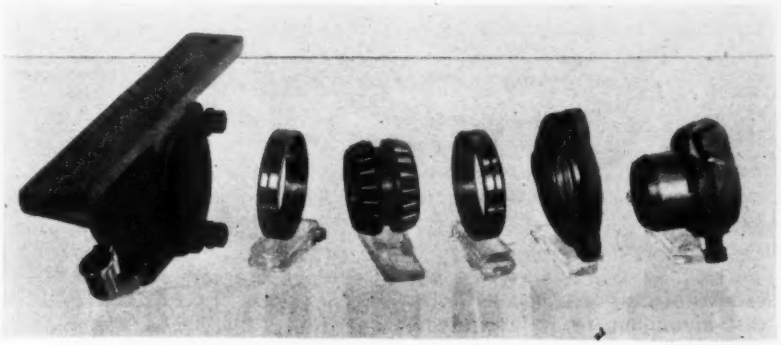
Assistant Engineer, Missouri Pacific Lines, St. Louis, Mo.

Number 4 of a Series

This installment of the series on the selection, care and operation of track motor cars is the second section of a two-part article on the construction of motor cars. The various parts that are dealt with in this article include bearings, brakes, couplers, lifting rails or handles, safety rails, tool and wheel guards and rail skids.

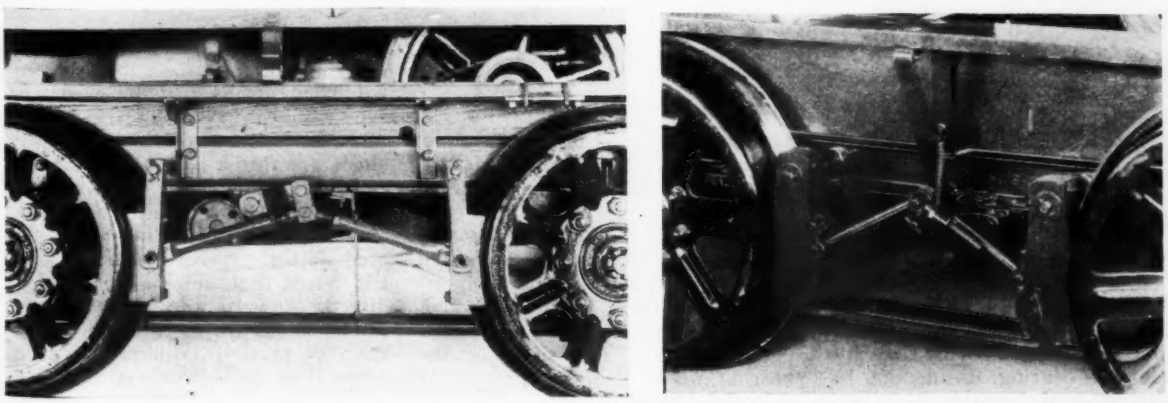
TO SUPPORT the frame of the car on the axles requires bearings within which the axles may turn. The earlier types of motor cars were equipped with a three-piece plain axle bearing consisting of a pedestal, a brass bushing and a collar. The brass bushing fitted into the upper half or pedestal and was held in position laterally by collars at each end of the bearing. The collar was provided with a pocket into which cotton waste, saturated with oil, was packed to provide lubrication. This collar was fastened to the upper half or pedestal by bolts extending through both halves of the bearing and the frame of the car. This type of bearing is now obsolete.

The next development was a plain roller bearing. In this a number of plain steel rollers, held in position by a cage, bore directly on the axle on the inside and against a hardened steel sleeve or outer race on the outside, all being mounted in a housing or pedestal bolted to the side members of the frame. The rollers ranged from ¼ in. to 7/16 in. in diameter, depending on the size of the axle. Later, the plain steel rollers were replaced by spiral rollers, which were more satisfactory as the spiral openings acted as oil grooves and improved the lubrication. While this type of roller bearing, with its outer race, eliminated the wear in the bearing housing, it only partially removed the wear from the axle itself. Axle wear was not only the cause of much maintenance expense but was also a hazard in operation; and the plain roller bearing hence also became obsolete, being superseded by the sleeve type roller bearing with a hardened inner race to protect the axle.



Disassembled View of a Tapered Roller Bearing With a One-Piece Inner Race for Two Rows of Bearings. When Assembled, the Thrust Collar (Right) Keeps the Inner Race of the Bearing in Correct Position on the Axle

Two distinct types of sleeve-type roller bearings have been used extensively, the principal difference being in the rollers. In one, the rollers have a beveled flange on one end similar to that on a car wheel, which travels in a groove on the inner race or axle sleeve, the outer sleeve also being beveled to fit the flange of the roller. These beveled flange rollers are thus expected to take care of any side thrust to which the car is subjected. The rollers in the other design of bearing are tapered and are mounted in tapered



Left—Close-Up View of Modern Braking Arrangement with Self-Centering, Metal Lined Shoes and Adjustable Toggle Arms. Right—Example of the Arrangement Formerly Used, Consisting of Plain Wood Shoes Pivoted at the Supporting Studs

races, two of which are used in each bearing assembly. This tapered feature is designed to maintain proper alinement and take care of end thrust as well as radial loads. A much preferred modification of the latter type has a single inner race that is tapered in two directions, with two cages of rollers, and two outer races.

The simplest bearing housing or pedestal is of cast or malleable iron or cast aluminum, or is fabricated from steel plates. There is a growing tendency toward housings in which rubber blocks or steel springs are used to cushion the vibration. Some of these housings have been in use for several years and have proved satisfactory, but unless they are carefully designed and well constructed of suitable materials, they may prove expensive to maintain in proper condition.

Thrust Collars

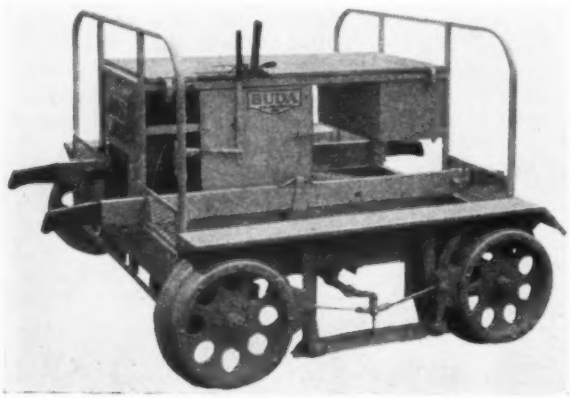
An important adjunct to any axle bearing is the thrust collar. This is a split sleeve fitted to the axle just inside each bearing, its function being to retain the bearing in its correct position on the axle. By adjusting the thrust collars, the front and rear wheels of the car can be brought into correct alinement. With the type of bearing that uses rollers with beveled flanges, the thrust collar has a lug on the end which, fitting into a corresponding recess in the inner race of the bearing, insures that the latter does not turn on the axle. This construction is not used with bearings incorporating tapered rollers.

Steady Bearings

If the car is driven by a belt or chain, a third bearing is commonly provided on the drive axle to resist the pull of the belt or chain. This is called a "steady" bearing. Care must be taken that it is in correct alinement with the other two bearings. Where spring or rubber-mounted axle bearings are used, the steady bearings should have a floating mounting, this being accomplished usually by hinging the bearing housing on the frame of the car somewhat ahead of the axle, so that it permits vertical movement of the bearing while resisting the pull of the belt or chain.

The more general use of a floating mounting of the steady bearing is desirable. It is especially desirable on wood frames as unequal shrinking or warping of the frame members may throw the three bearings out of line. Even on cars with metal frames, a floating mounting of the steady bearing may reduce the detrimental effects of slight warping of frame members which may result from overloading the cars or from accidents.

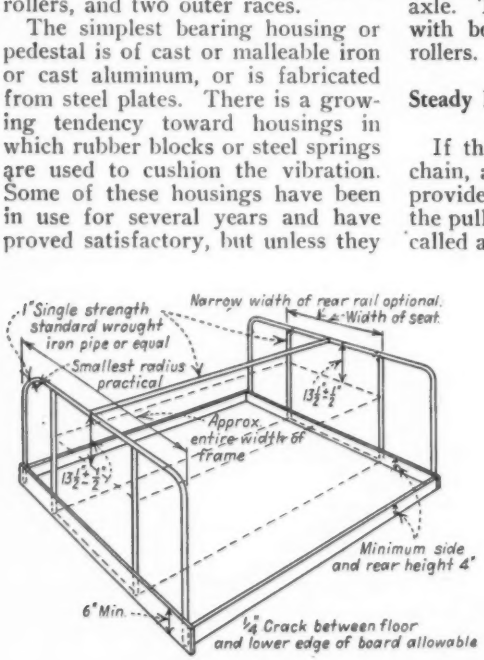
In this connection, it should be noted that the pull of a belt on the axle is much greater than that of a chain; with the chain there is only the pull required to drive the car, while with the belt this pull is augmented by the tension necessary to provide sufficient friction of the belt on the pulleys, and in the hands of a careless operator, this pull may often be much more than is required. In some cars the drixe axle is made somewhat larger in diameter at the center, tapering to normal size at the end bearings, and in this way is stiffened sufficiently so that no steady bearing is required.

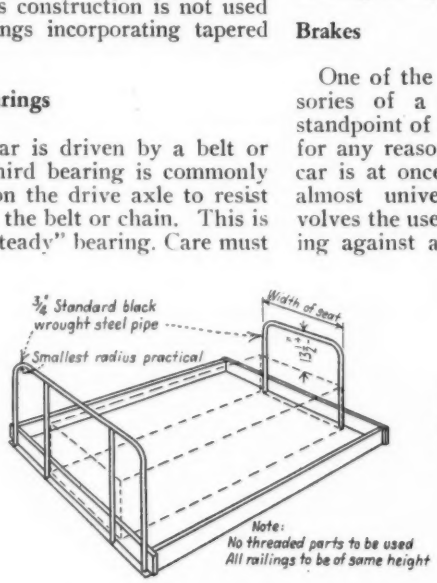


In This Motor Car the Rail Skids Are Directly Over the Rail and Serve Also to Support the Brakes

Brakes

One of the most important accessories of a motor-car, from the standpoint of safety, is the brake; if, for any reason it is inoperative, the car is at once out of control. The almost universal construction involves the use of brake shoes thrusting against all wheels at the same time. The shoes, usually supported from studs on the outside of the side frame members, hang loosely in line with the treads of the wheels and when the brake is applied, these shoes are thrust against the wheels by toggles actuated by a brake shaft, controlled in turn by a lever or pedal. Originally, the shoes were pivoted at the supporting studs, with the result that, instead of moving directly toward the wheels, they swung in an arc so that the top of the shoe pressed harder against the wheel than the bottom, and the wear on the shoe was therefore uneven. The modern method uses self-centering hangers, by means of which the





A. R. E. A. Safety Rails for Gang Motor Cars (Far Left) and Light Inspection Motor Cars (Near Left)

shoe is permitted to adjust itself to the contour of the wheel, applying practically uniform pressure throughout its length.

Originally the shoe was of wood and bore directly against the wheel. This gave fair braking action in dry weather, but was very ineffective when the shoe was wet. Wooden shoes without facings are now used very little and various other materials have been tried for facings. The requirements are: (1) that the friction between the shoe facing and the wheel shall not be affected by weather conditions; (2) that the facing shall be reasonably inexpensive and at the same time fairly durable; and (3) that it shall not be so abrasive as to wear the tread of the wheel unduly. Plain grey iron castings have been found to meet all of these requirements better than any other material.

The facings should be generous in area; the width, especially, should be sufficient to extend the wear of the shoe on the wheel beyond that of the rail on the wheel; this suggests a width of not less than 2½ in. The greater the area of contact between the shoe and the wheel, the less will be the wear on each in providing effective braking action; therefore the facing should also be ample in length —5 or 5½ in. is not too great for this dimension.

The shoe facing must be insulated from the hangers and toggles; otherwise the car will close the track circuit when the brakes are applied. The wooden shoe meets this requisite admirably if care is taken that there is no metal-to-metal contact between the facing or the bolts securing it to the shoe, and the brake mechanism.

In order that uniform pressure can be secured on all wheels, it is desirable that all toggles be adjustable. Their position will vary slightly as adjustments are made, but in design they should be so positioned that the thrust is largely toward the center of the wheel. If the direction of the thrust is too much downward, much of the force applied to the brake lever will be lost.

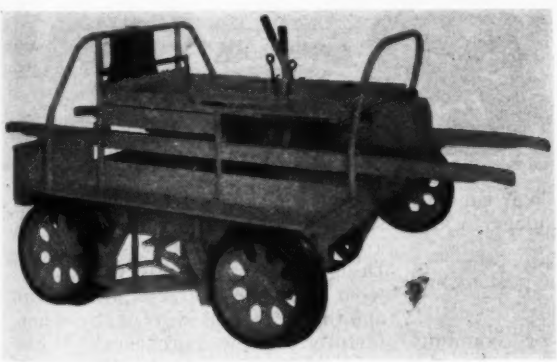
Hand or Foot Operation

The brakes are controlled by the operator by means of a lever or by a foot pedal, each of which has advantages and disadvantages. It is claimed that the use of a lever permits greater braking power and avoids the possibility of failure of brakes through tools on the deck of the car interfering with the operation of the pedal. Conversely, it is claimed that the foot or pedal brake may be applied quickly by the operator without interference with other men on the seat of a crowded car and without the operator taking either hand from the controls.

By far the greater number of cars now in use are equipped with hand-operated brakes. It should be noted, however, that on large cars having a selective transmission, either the brakes or the clutch should be foot-operated, as the brake, clutch, and shift lever must frequently be used simultaneously with each other.

Whether hand or foot-operated, the brakes should not lock in the applied position without separate definite action by the operator. Recalling again the common method of removing a car from the track, it is apparent that the brakes must be released while this is being done, or the wheels will not rotate. With a self-locking brake, the operator may not, in an emergency, realize that the brakes are set until it is too late to save the car. This is of enough importance to warrant an example; on many cars, the brake lever is at the operator's right hand, the brakes are applied by pushing on the lever, and the direction of the thrust is, therefore, obliquely forward and to the right. In such cases, the notch for locking the brake lever should be in the left hand side of the slot through which the lever moves, rather than in the right hand side. Often a spring to hold the lever against the right hand side of the slot is desirable; and in some cases a latch, to be manipulated by one hand as the lever is held forward with the other, has been required.

A Heavy-Duty Motor Car with Lifting Handles



Inspection Car with Modern Brakes and Special Re-Railing or Set-Off Skids

Brakes for Party Cars

On party inspection cars, various braking systems, both hand and power-operated, are used. Band brakes of the automotive type are common on cars in this service. Formerly, band brakes were also used on some small cars but they have now been displaced largely by the brake shoe type. Where wheels with rubber facings on the treads are used, special shoes are required which act against the wheel flanges rather than against the treads.

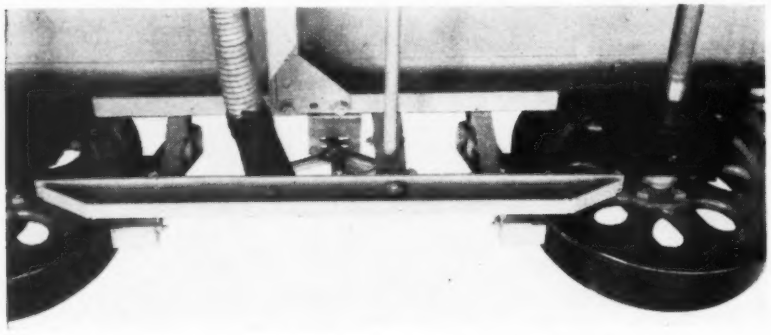
The practice of towing push cars or trailers behind the larger motor

cars is becoming more common, and the character and use of couplers are, therefore, increasingly important. The term coupler is used very loosely and for that reason the A.R.E.A. defines the coupler and its component parts as follows:

"Coupler—The device by means of which any car or machine to be towed is connected to the towing agency. The coupler includes the drawhead and coupler link and pins, or other device for connecting two drawheads."

"Coupler Drawbar—The portion of a coupler used to connect the drawheads of two cars or other units of roadway machinery."

"Coupler Drawhead—That portion of a coupler that is rigidly attached to a motor car, trailer or unit of roadway machinery designed to be towed."



Underside of a Modern Motor Car Showing One of the Rail Skids

Drawheads

A drawhead should be provided at the rear of every motor car; even the smallest car will occasionally be used for towing a light push car or perhaps another motor car. Gang cars should have drawheads at both the rear and the front, as two motor cars may sometimes be used tandem in towing several push cars or trailers. The design of the drawhead and the manner of attaching it to the car vary with the design of the car frame; but, regardless of the size of the wheels, the drawhead should be uniformly 14 in. above the top of the rail; this is the A.R.E.A. recommendation. If the height of the drawhead on one car is greater than that on the other, there will be a tendency to raise the end of the car having the higher drawhead, and possibly derail it, when the brakes on the towing car are used suddenly.

Where the frame is of wood, an eyebolt or U-bolt is often provided as a drawhead. On steel frames, the most common type is heavy steel strap bolted to the car frame and extending out a few inches from the end sill. Often the end of the strap is rounded so that the coupler link or draw-bar will not bind if the two cars are not exactly in line, as may occur when "setting over" the cars at a switch. The hole in the drawhead should be large enough to take a 1-in. coupler pin, or a hook of that dimension if a hook-type drawbar is used. The drawhead must be sufficiently strong and so attached to the car frame that the stresses of either towing or stopping the rear car will be absorbed without damage to any of the parts.

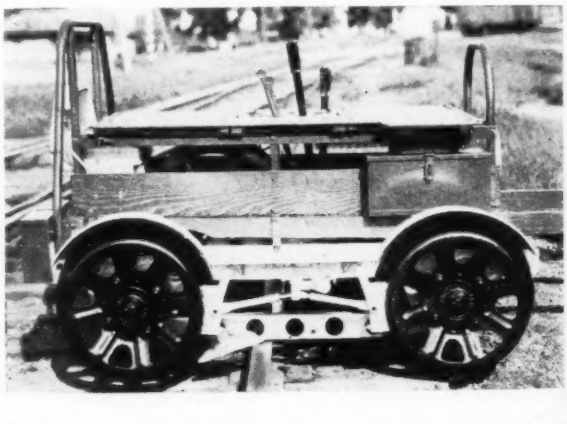
Many Designs

Coupler drawbars or coupling links are of many designs. A good coupler drawbar must meet three requirements: (1) that it is adequately strong and stiff to take both the towing load and the thrust of a sudden stop; (2) that it will not become disconnected accidentally and (3) that it can be disconnected quickly in an emergency. The last requirement is quite as important as the other two and somewhat more difficult to meet, for with nearly every design some slack between the cars is necessary to permit uncoupling; and, especially on a grade, this may not be easy to get.

However it is done, handling a car to and from the track involves considerable lifting. Gang cars usually are provided with a lifting rail at each end of the frame, that extends the full width of the car, permitting a number of men to get into a position where they can lift it safely and conveniently. As described in a previous article, these lifting rails may be extensible to give additional leverage when the car is to be rolled off the track. All modern small cars have extension lifting handles, as such cars are usually rolled from the track; but stationary handles should be provided at the outside corners at each end for use when cars are carried bodily from the track.

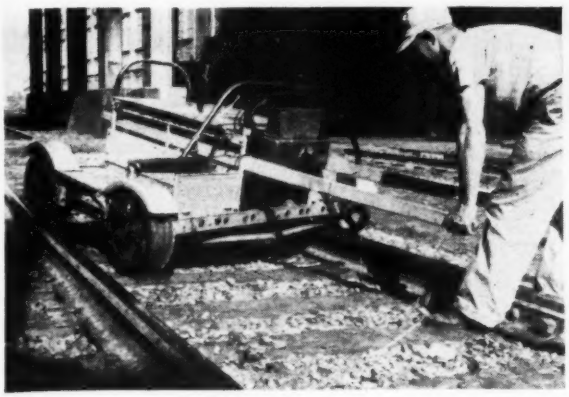
Safety Rails

Certain devices have come into use on modern cars through the effort to eliminate, so far as possible, the hazards in operating and handling the cars. Safety rails, tool guards, foot boards, rail skids, and setoff skids are of this character. The use of safety rails is so universal that cars are no longer built without them. Designs of safety rails vary somewhat with the character of the car and the individual ideas of the manufacturer or the purchaser. When safety rails first came into use, many direct-connected cars were still in service and, in order that the men pushing such a car to start it could readily mount the rear after the car was in motion, the rear safety rail was made only the width of the seat deck. This width is still common on most small cars, but the practice varies on gang cars. Where the rules permit running cars in either direction, it is obvious that the safety rails on both ends should be the full



Showing Use of Re-Railing or Set-Off Skids on a Light Inspection Car

width of the car. Designs for safety rails for section duty and smaller cars, as recommended by the A.R.E.A., are shown in the accompanying drawings. Many light inspection cars, however, have safety rails of lighter design in order to conserve weight. With the thought that the safety rail should be within easy reach of every man riding on the car, a center rail from front to rear should be provided on every gang car, although this center rail is often omitted on section cars. It is obvious, of course, that the safety rails must be strong enough to resist considerable shock.



A Recent Development Is the Front-End Skid for Inspection Cars

Tool Guards

Adequate tool guards at the front ends of the tool trays are quite as important to safe operation as safety rails; and if the rules permit operation of the car in reverse direction, they should be provided at the rear as well. There is no general agreement as to what constitutes an adequate tool guard and, in consequence, practice varies widely. The A.R.E.A. plan for safety rails shows minimum tool guard heights of 6 in. for the front, and 4 in. for the sides and rear of tool trays. It may be questioned whether these heights are sufficient, although the need varies greatly with the quantity of tools carried and the care with which they are stowed on the car.

The materials of which the guards are made also vary greatly; some are of wood, others of wire netting, and still others of sheet iron. One road uses wire netting (front end screen) about 16 in. high and another uses sheet iron, increasing the height to that of the safety rail so that it also serves as a wind shield. Besides the tool guards at the ends of the tool trays, the space under the seat deck should be protected in a similar manner, to prevent tools or materials from coming into contact with the engine or other machinery forming part of the motor car.

Wheel guards are usually provided over each wheel on the smaller cars, or as foot boards extending over the wheels for the full length of the car. These guards serve not only to protect persons on the car from wind or water thrown up by the revolving wheels, but also to prevent injuries or damage to clothing through contact with the wheels.

Rail Skids

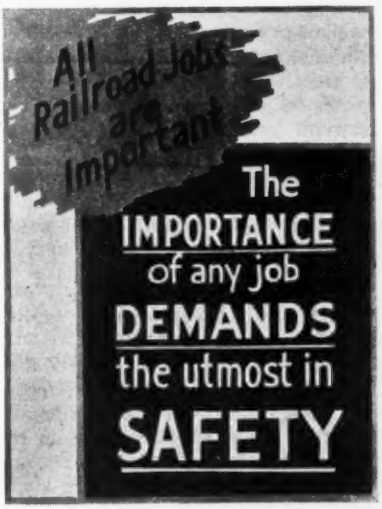
For reasons set forth in a previous article, rail skids are considered essential on modern cars. Ideally, these should be located directly over, and not more than one inch above the rails, but this introduces construction difficulties and they more commonly conform approximately to A.R.E.A. recommendations that the bottom of the skid shall not be more than 3 in. above the top of the rail and the skid shall not be more than ½ in. from the back of the wheel flange. Since the skids must often take the weight of the car plus the impact from the dropping of that weight through several inches, they must be strong and well braced. Steel angles combine necessary strength and stiffness with reasonably light weight, and are used more generally than any other material. If angles are used, the skids should be so built that the flat side (not the edge) of one leg of the angle will contact the rail when the skids are in use.

Set-Off Skids

A comparatively recent development of the rail skids on small cars is the addition of what are called re-railing or set-off skids. These are attached to the front ends of the rail skids just back of the front wheels and provide a sloping surface that raises the car as it is skidded across the rails, so that the wheels, when they reach the rail, roll over it readily. The set-off skids do not function when handling the car at a road crossing or a motor car set-off; but where the track is open, they are very helpful in re-railing this car and are especially valuable in setting it off as this must often be done quickly. Another development of some promise is the front end skid which extends across the front of the car and supports the car when it is in an oblique position with the front end straddling the rail.

Special Equipment

Many special devices that are not furnished by the manufacturer as standard equipment, are often applied to motor cars. These usually are designed to add to the comfort of the men using the car, to speed up its loading or unloading, to conserve the loading space on it, or to serve some purpose peculiar to the locality or service in which the car is used. Wind shields and canopy tops are coming into use increasingly, especially where the cars must be operated regardless of weather conditions. Electric lights are often provided for such cars as are frequently used at night, or where foggy weather or dust storms prevail. The car manufacturers are prepared to furnish these items when required. Other special devices, such as carriers for water kegs, level boards, or special tools are often developed by those railroads which feel the need for such accessories.



This Poster, No. 264, Constitutes the September Installment of the "All the Year-Every Year Safety Program" of the Safety Section, Association of American Railroads

What's the ANSWER?

Preboring Switch Ties

Is it practicable to prebore switch ties for spikes? If so, how can the holes be located? If not, what measures can be employed to protect spike holes against decay?

Finds Some Difficulties

By I. H. SCHRAM
Chief Engineer Maintenance of Way, Erie, Cleveland, Ohio

It is assumed that the question includes the boring of the spike holes for the turnout rail as well as for the main rail. Inasmuch as the Erie uses lag screws as hold-down spikes on ties and timbers, we have given this matter serious consideration, because it is quite desirable to prebore for lag screws. As we know them in our area, the boring machines at the treating plants are not made to handle any but the shorter timbers. They would have to be rebuilt to prebore switch ties, with the result that they would then be large and cumbersome, which would be difficult and expensive to use for preboring track ties.

Our practice at the treating plant is to treat the switch timber as it completes its seasoning period, and then store it by lengths. As the ties are shipped out, the necessary timbers are withdrawn from this stock and are built up into sets for whatever number of turnout is required. Our standard turnouts are 8, 10, 16 and 20, although, occasionally, we make up special sets for special conditions. We also ship miscellaneous lengths as they are ordered from the field.

If these timbers were prebored they would not only have to be assembled for lengths, but for the number of the turnout as well; and also in the case of the longer turnouts, for use with either curved or straight switches, as the curvature and length differ. The result would be that a larger storage space would be required, as well as a large increase in the number of ties to be kept in stock.

So far as we know, the best practice in applying lag screws, after the turnout rails are laid, is to line the rails and bore the holes with a power boring machine, then fill the holes with hot creosote, after which the lag screw or spike is applied. There are several bolt-hole treaters on the market, which apply the creosote with pressure.

Thinks Well of It

By ROADMASTER

What I have to say about this matter is based on the results obtained from rough tests of a practical nature, made on a line under my charge, which carries an extremely dense and heavy traffic. The results of these tests have led me to believe that, through the preboring of switch ties for heavy and moderately-heavy traffic, there may be surprising economies, which few of us appreciate and to which most of us have given no consideration. I can visualize corresponding economies for lines of lighter traffic, but I also appreciate that they may be off-set to a considerable extent by other factors.

The turnouts included in this test were located in an interlocking which handled several hundred train and engine movements a day, every one of which was a diversionary movement. All of these turnouts were equipped with tie plates, and some of them were spiked in the conventional manner with cut spikes, without preboring. The remainder had the spike holes prebored for both the main and turnout rails. There was a startling difference between the two, with respect to maintenance.

At the end of two years no regaging of the turnout rails had been necessary in the turnouts laid with prebored spike holes, although those that were spiked in the conventional manner had all been regaged once, and some of them twice, during this period. Based

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered In November

1. *What precautions should be observed when burning the right of way? In what ways is this affected by the character of the adjacent land?*
2. *What causes paint to wrinkle? Should the old paint be removed before repainting? Why? If not, how should it be treated?*
3. *What are the advantages of transposing rails on curves compared with regaging? The disadvantages? Why? Does the weight of the rail or the degree of curvature make any difference? The density or speed of traffic?*
4. *Where an entire pile bent of a ballast-deck trestle requires renewal, is it preferable to redrive it or to erect a frame bent? Why? How should the work be done?*
5. *What are the essential requirements for a tie plate? Can tie-plate design be standardized? Why?*
6. *What are the advantages of welded compared with riveted tanks for water treatment and storage? The disadvantages?*
7. *What is the island or boxing method of applying anti-creepers? What are its advantages? Disadvantages?*
8. *What are the principal causes of personal injuries to bridge and building men? How can they be reduced?*

on allowing a widening of the gage up to 5/8 in., either through spreading or curve wear, or a combination of both, at the end of the two years it was estimated that it would be another year before the turnouts with the prebored holes would require regaging. All of the holes were bored by hand, yet the increased labor cost for the completed turnouts was only about five per cent more than for the turnouts spiked in the conventional manner.

Both flat and corrugated-bottom tie plates were employed in the installation. The flat bottoms sank into the oak ties only enough to outline themselves and caused no apparent abrasion, since the surface under the plates were smooth and glazed. On the other hand, the corrugated bottoms settled into the wood from 1/4 to 9/16 in., distorting the wood fibers in the process. It was an interesting and somewhat surprising fact that, although the turnouts laid with the flat-bottom plates, but without preboring, were gaged only once during the two years the test continued, those using corrugated bottoms needed to be regaged twice.

The turnouts in the test were installed with new material throughout, including 131-lb. rail. Under traffic of the density these tracks carried, there can be no doubt about the economy of preboring the spike holes for both the rail spikes and the hold-down spikes, for the life of the ties was at least doubled, and may have been increased still more, although the test was completed before this information was recorded. This would doubtless also be true under less dense but still heavy traffic. There were no signs of decay in the prebored holes, but initial decay was visible around the spikes in the turnouts that were not prebored, and the holding power of the spikes was impaired.

I am not in position to judge whether preboring as a general practice is feasible, but it certainly is for heavy, high-speed traffic, where switch ties are renewed as a set. There may be some difficulties attached to the practice where the spot method of renewal is followed under lighter traffic. Even here, however, I believe that it is possible and that it will pay attractive dividends.

What is Improper Spiking?

What constitutes improper spiking? What are the effects? How can this be overcome?

A Matter of Education

By R. H. Gilkey
Division Engineer, Central of Georgia, Savannah, Ga.

Improper spiking consists primarily of driving spikes into the ties crooked, that is, leaning in any direction. Spikes should be driven straight. Where there are no tie plates, the spike should be set flush with the base of the rail. Where the ties are equipped with tie plates the spike should be set straight in the hole and driven plumb. It should never be bent over to clamp the rail, or be driven sidewise. Furthermore, only a uniform job of spiking is fully satisfactory.

The effects of improper spiking are that creeping rail binds on the spike heads, pulling them sidewise, which tends to split the ties. Again, if the spike is driven sidewise, the rail flange rubs on the spike and cuts it. Spikes should not be driven too hard under the last blows, for this results in overdriving, with the spike head, or neck, overstrained, so that it eventually breaks off entirely.

The only way to overcome improper spiking is to require that the foreman supervise his spikers and instruct them in correct methods, and that he follow this up to insure that they are doing the job correctly. Good spiking is a matter of education, but it is often neglected, with the result that the job looks "sloppy" and the riding quality of the track is made poorer by kinks, split ties and uneven side strains.

Must Not Draw Spike

By W. Woolsey
Section Foreman, Illinois Central, Chicago

To drive a spike correctly, it must be started perpendicular to the plane of the tie or, rather, to the base of the rail, and must not be allowed to vary from this perpendicular position while being driven. In other words, the spiker should not be allowed to "draw" the spike as it penetrates the tie. A careful spiker is careful never to strike the spike too hard on the last blow, as this either cracks the spike through the neck or breaks the head off at once.

Several factors contribute to improper spiking. If the spike is set so that it leans in any direction and is then driven in that position, it will slant into the tie and will never have the holding power that the same spike driven straight should possess. Many otherwise good spikers set the spikes slanting away from the rail, thus driving the point under the rail. When lacking about an inch of being driven home the spike is tapped and bent over to the rail and then the driving is completed. Such a spike appears to be driven vertically, but its usefulness is greatly impaired. This practice also enlarges the spike hole at the surface of the tie and thus allows water to enter, making the wood soft and spongy and setting the stage for early decay around the spike. Again, the completely useless practice of setting the spike in a slanting position and then drawing it as it goes down, results in a similar enlargement of the spike hole. Both of these practices account for many of the high or protruding spikes which appear in sound ties, and which require frequent attention.

Keep Them Vertical

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Driving spikes in any way except at right angles to the plane of the base of rail and in contact with but not crowding this base, constitutes improper spiking. In other words, spikes must not be slanted under the rail or in either direction longitudinally with it. Slanting spikes are usually driven for the convenience of hand spikers and a temporary fit to the rail is made with a final sidewise blow. Driving a spike slanting gives a poor spiker a little more leeway against striking the head of the rail with the spike maul. Except for this, all results of improper spiking are bad. Spikes slanted under the rail cause poor gage, make the line of the rail weave under load and, if bad enough, may break moon-shaped pieces from the base of the rail, or wear nicks in the base that may cause the rail to rupture.

Although modern tie plates are conducive to satisfactory spiking, there are places where tie plates may not be economical. It may also be well in some cases to use old plates with holes that are large enough to allow spikers to slant the spikes to suit their convenience. Guarantee against improper spiking under all conditions can be obtained by adzing and boring for the plates and spikes before the ties are treated. This will allow the bearing surfaces of all plates to

be in the same plane as the base of rail, and guide the spikes down a hole at right angles to this plane and at the correct distance from the base of the rail. Whether or not ties are prebored, it will be found to be easy to drive spikes correctly with spike-driving machines. Such machines are almost mandatory when driving in unbored hardwood ties.

Using Iron Staging Hooks

When necessary to employ staging for the repair of timber trestles, are there any advantages in using iron staging hooks? Any disadvantages? Why? How can they be attached to the bridge? How adjusted for height?

Sees No Advantages

By V. E. Engman
Chief Carpenter, Chicago, Milwaukee, St. Paul & Pacific, Savanna, Ill.

There are no advantages in the use of iron staging hooks to suspend staging for the repair of timber trestles. It is difficult to design a hook of a single size that will fit the variable dimensions of the timber to which they are to be attached. Iron hooks are cumbersome to handle and, if made adjustable for height, considerable weight is added. Furthermore, weakness that is not easily detectable may develop in the hook and cause a failure. Manila or hemp rope meets all of the requirements for suspending staging for bridge work. Rope can be handled easily or be attached anywhere at any height, and can be adjusted as desired. Any weakness or defect in the rope can be detected readily.

Do Not Use

By J. S. Hancock
Bridge Engineer, Detroit, Toledo & Ironton, Dearborn, Mich.

We do not use iron staging hooks for the repair of timber trestles. The majority of our trestles are low open-deck structures, and our present method of swinging staging from the guard timbers by means of manila rope has proved to be entirely safe and reasonably convenient. Our method of staging is to swing a galvanized steel pipe, 20 ft. long, on each side of and parallel with the trestle, at the desired elevation. The pipe is lowered and held in place by means of manila rope fastened near each end of the pipe, the rope being wrapped once around the guard timber with the loose end returned and snubbed around the pipe when it has been lowered to the desired elevation.

The pipes support 2½-in. by 12-in. by 20-ft. wood plank placed at right angles to the trestle. As this type of scaffolding is easy to lower but difficult to raise, the work on any bent progresses from top to bottom. In case the staging has to be raised, a derrick mounted on a push car is readily available and is used for this purpose. For this type of staging, the manila rope can be fastened around the guard timber as easily as to any iron hook, and the iron hooks would be just that much additional equipment that it would be necessary to carry in the already overcrowded tool cars.

We use iron hooks only for staging on steel structures, where the sharp corners of the steel members would endanger the manila rope. However, in the event the timber trestles are of a considerable height, involving both the raising and the lowering of the staging, I would consider the iron hooks advantageous, since such staging could be hung from the hooks by means of block and falls, so that the raising and lowering operations could be performed readily by the men while they remain on the staging. In this case, the iron hooks could be hooked over the guard timber, with an eye on one end of the hook for attaching the block and tackle.

Should They Have Brakes?

Should brakes be installed on push cars and motor-car trailers? Why? What type of brake?

Car Brakes Not Enough

By Supervisor of Work Equipment

It is generally recognized that brakes and safety railings should form a part of the equipment of all motor-car trailers used for transporting men. It seems equally desirable that trailers handling materials should also be equipped with brakes. Trailers often carry loads greatly in excess of the weight of the ordinary section motor car. It is not to be expected, therefore, that the braking power of the motor car alone can be very effective in bringing the motor car and loaded trailer to a quick stop in case of an emergency. It also appears that in such cases brakes on the trailer will be more effective than those on the motor car, because of the greater weight of the trailer and its load.

There is some question as to the necessity for brakes on push cars where they are used in yard work and are not attached to motor cars at any time, but if there is a possibility that they will be used as trailers they should also be equipped with brakes. The brakes used on both trailers and push cars should be of the hand-operated type, the same as is used on motor cars, since material loaded on the car may interfere with the operation of foot brakes, which are also more difficult to operate and are less effective than hand brakes.

When operating trailers carrying men, one man should be delegated to operate the brake. A man should also be assigned to the trailer to act as brakeman where the car is used to transport material. No others should be permitted to ride on the trailer, however, while it is being used for transporting material.

Needed for Emergencies

By O. G. Prince
Section Foreman, Central of Georgia, Godfrey, Ga.

Trailers and push cars carrying men or materials should not be attached to motor cars unless they are equipped with effective brakes on all wheels. I have never seen a motor car equipped with sufficient braking power to hold back push cars and trailers when necessary to make a quick stop, and without brakes on the trailers and push cars in this service, serious accidents are possible. Motor cars handling heavy loads do not respond quickly to the application of brakes. A railway that does not provide safety devices is scarcely in position to demand safety in operation.

As I view the matter, there are three agencies responsible for accidents in motor-car operation:

(1) Motor-car manufacturers who

do not equip these cars, including trailers and push cars, with safety devices.

(2) Railways that purchase these cars without safety devices.

(3) Foremen and operators of motor cars, trailers and push cars, who do not handle them the safe way.

Thirty-nine years of experience in the operation of motor cars with trailers attached, have taught me that an important factor in the avoidance of accidents is the use of brakes on the trailers.

Trailers Should Have Them

By J. G. Hartley
Assistant Engineer, Pennsylvania, Philadelphia, Pa.

Man-hauling motor-car trailers should have brakes. If motor-car brakes have insufficient friction to control both the motor car and the trailer, the brakes on the trailer can assist and may avert a possible accident. Push cars should not have brakes, as they are used for handling tools and materials, and no one should be allowed to ride on the top of tools and material, as accidents have occurred by reason of such practice. Even allowing men to ride on an empty push car should not be countenanced, since they are not equipped with safety rails or grab irons.

The type of brake to be used on a man-hauling trailer is a mechanical toggle brake, comprising a hand lever with a spring catch to operate on a notched quadrant, so that the brake can be applied as needed and can be set on the quadrant by the latch to prevent the trailer from moving when so desired.

Tells of Automatic Brake

By M. Brewer
Section Foreman, Georgia Railroad, Robinson, Ga.

I am convinced that half of the amount paid out in accident claims arising from motor-car accidents, together with that required for the replacement of damaged motor cars and materials, would be sufficient to equip all motor-car trailers and push cars with brakes, and that this would practically eliminate the type of accidents that occur by reason of insufficient braking power on the motor cars when they are hauling loaded push cars and trailers.

A few months ago I had the pleasure of operating a motor car and a trailing push car that was equipped with four-wheel brakes. This was the simplest and most effective braking device I have seen during 20 years experience in track maintenance. The brake, which was connected with the push-car coupling to the motor car, was self acting, without levers or cables. I was able to stop the motor car and push car, both of which were loaded to capacity, as quickly as if I had been using the motor car alone.

Brakes Pay Dividends

By E. Burke
Assistant Supervisor of Track, Central of New Jersey, Jersey City, N. J.

The roller bearings with which all modern motor cars are equipped, offer little resistance to the continued movement of a motor and trailer once they are in motion. For this reason, brakes become necessary to overcome the energy represented by their mass and rate of motion, and thus reduce their momentum, and permit a quicker stop to be made. Accident prevention costs less than accidents. The amount involved through personal injuries occurring in a single accident will equip many motor-car trailers and push cars with four-wheel brakes. It is my belief that all push cars should be equipped with wheel brakes when purchased, and that roller-bearing push cars now in service and used on tracks that are not level should be equipped with brakes.

A similar situation exists with respect to trailers. By placing detachable seats on a push car it can be made into a trailer for the transportation of workmen, so that in the interest of safety it should have four-wheel brakes.

The type of brake that should be provided will vary with the grades over which the cars are to be operated, but whatever the type of brake, the brake shoes should be wood, with metal linings for easy replacements.

Painting Asbestos Shingles

Can asbestos shingles and siding be painted? How is this done? What kind of paint? What precautions? What are the advantages?

Must Be Clean

By E. H. Wells
Chief Engineer Transportation Department, Johns-Manville, New York

Aside from the fact that we have done sufficient development to establish that asbestos siding and shingles can be painted, we have generally preferred to leave the specifications for the paint to the paint manufacturers, the reason being that there are so many different types of paints and methods of application, and since the success of the application depends upon the paint rather than upon the asbestos material, it is generally preferable to have the paint manufacturer provide the material.

However, to obtain a satisfactory job with any paint it is highly important that the surface to be painted be clean and dry, and that all loose dirt and efflorescence have been removed. A heavy brush coat of boiled linseed oil should be applied to all exposed surfaces and edges, brushing the oil well into the surface. Any remaining suction spots should be given additional coats of boiled linseed oil until none remain, before applying the subsequent two or more finish coats of exterior oil paint. The linseed oil should dry at least 24 hours before applying the paint.

Painting is not necessary for the preservation of the asbestos siding or shingles. The only advantage of applying the paint is to change the appearance of the surface or to provide a color scheme that did not exist previously.

Only for Appearance

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Asbestos surfaces cannot be painted in the same manner that steel or compactly-grained wood surfaces are painted for the asbestos composition will draw the oil out of the paint, allowing the pigment to weather, streak, mottle and deteriorate badly shortly after it has been applied. In one instance a linseed oil-lead paint was mixed with about three times its volume of refuse crank-case oil and this mixture was filtered or screened, and a heavy coat was applied to the asbestos siding with good results, for it has now lasted for five years. However, this was a tinting job rather than a painting job. It seems that asbestos shingles can be tinted more effectively than they can be painted. If it is found necessary to color as-

bestos surfaces, a good grade of paint should be thinned, cut with a good dryer and applied in one thick coat. The surface should not be sized as this will make a bad and poorly-lasting job.

There are no mechanical advantages in tinting asbestos surfaces. If for appearance sake, this is to be done, shingles of the desired tint should be used at the time they are applied. Then, no later tinting of the surface will be required, unless the color scheme is to be changed.

Can Be Painted

By J. J. La Bat

Assistant Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Both roofing shingles and siding can be painted. Shingles can be coated with a suitable chlorinated rubber enamel or with a heavy brush coat of boiled linseed oil, followed by three coats of good exterior paint. Good results have been obtained by first applying a coat of aluminum paint, followed by three coats of exterior paint. If the foregoing procedure is not followed the paint is quite likely to peel.

I do not see any advantage in painting asbestos shingles and siding. They do not need the painting to preserve them from decay or other deterioration. It is evident, therefore, that the primary reason for painting is for the sake of appearance. Asbestos shingles come in distinctive textures and shadow effects, rather than color, and when dirty they can be cleaned. Manufacturers of these products, some of them at least, can furnish cleaning compounds, and I prefer the cleaning to the painting, since they can be cleaned as often as may be necessary.

No Advantage

By General Inspector of Buildings

There are no advantages, so far as I am aware, that accrue from the painting of asbestos shingles and siding, since they do not need the protection that is afforded by paint to other surfaces. On railway structures these materials frequently become stained and badly soiled, but they can be cleaned with relative ease if the manufacturer's instructions are followed. This leaves but one reason that I know of for painting either the shingles or the siding. This is to make them fit into a new color scheme that may be desired.

If the shingles or siding is to be painted, meticulous care should be exercised to insure that all loose dirt has been removed. This can be done with a stiff bristle brush and, if necessary soap and water. Likewise, all grease and oil must be cleaned from the surface. When completely dry, the surface should be treated to a heavy brush coat of boiled linseed oil, which should dry for not less than 24 hours, after which two or three coats of paint can be applied.

Repairing Track Tools

Who should make repairs to track tools? To whom should they report? Should repaired tools be returned to the section that sent them in, or should they be held and reissued on requisitions? Why?

Require Trained Mechanics

By A. Drager

Maintenance of Way Storekeeper, Central of New Jersey, Jersey City, N. J.

This is a problem to be solved only by giving careful attention to the following fundamental questions:

(1) Where can the best workmanship be obtained?

(2) How can repairs be made in the shortest time?

(3) Who can do the work most effectively and economically?

Repairs to hand and power-operated tools can be made most satisfactorily and economically in a machine shop that is directly under the jurisdiction of the maintenance-of-way department. If repairs to power machines and tools are made in shops under the jurisdiction of the mechanical department, experience has shown that, since the primary duty of these shops is to overhaul and repair locomotives and cars, first consideration is given to the cars and locomotives, and that the maintenance-of-way equipment is given secondary place in the shop program.

A different situation presents itself with respect to hand tools, such as tamping and clay picks, spike mauls, sledges, chisels and other tools made of alloy steels. These tools require heat-treating furnaces, power hammers, testing apparatus and other equipment that is available only in an up-to-date blacksmith shop. Such shops are operated by the mechanical department wherever cars and locomotives are being repaired.

However, the mechanic assigned to repair and reshape these tools must be furnished with definite instructions and specifications for doing the work, and be required to fulfill them. These instructions should cover both shapes and dimensions, as well as quality. Track gages and level boards can ordinarily be reconditioned and adjusted most satisfactorily by a competent carpenter who is familiar with these tools and knows the purposes for which they are used. This work can be done in any carpenter shop having the simple equipment needed to test the gages and levels.

Maintenance-of-way workmen must have good tools to do their work effectively. Worn out or damaged tools, even in the hands of experienced and capable workmen, are time wasters. In a certain case, an unreasonable delay occurred in providing a ballast gang with good tamping picks. This made it necessary to use worn tools temporarily, with the result that the efficiency of the gang dropped about one-third, thus wasting $1.33 per day per man. Since the delay lasted for 10 days, the loss to the railway was $13.33 for every man in the gang. It is of interest in this connection that new tamping picks cost only $0.91 apiece.

Tools that have been reconditioned should be returned to the storehouse, where they should be inspected carefully and checked to insure that they have been returned in first class condition and meet minimum requirements. They should then be sent out on requisitions the same as new tools.

It is of the utmost importance that requisitions for track tools be filled promptly. Yet with the utmost dispatch in handling, several days will of necessity intervene between the time the foreman makes his requisition and their delivery. In some cases it may be desirable for gangs to carry a duplicate set of tools or duplicates of some of those they use.

It is the responsibility of the foreman to send in his tools when they are in need of repair. However, the storekeeper must assume the responsibility of seeing that all track tools are repaired or reconditioned without delay when they are received. It is also his responsibility to make sure that the repairs have been made in accordance with the specifications and that they meet minimum requirements. It is his further responsibility to know that only first-class tools, either new or reconditioned, are furnished to the

track forces for use in the field.

Management also has a responsibility, for it should insist on good housekeeping and assist in such ways as it can. It should recognize that no foreman can look over track tools in a tool house in which everything must be crammed into inadequate space. This will reduce the probability that tools will become lost or mislaid, and eliminate the tendency to acquire an over-supply of tools and supplies.

Held for Requisition

By E. E. Crowley
Roadmaster, Delaware & Hudson, Albany, N. Y.

It is my understanding that most roads return worn and damaged track tools to the stores department for repair. Some roads operate supply cars to deliver tools and supplies and to pick up tools requiring repair. Other roads ship the tools and supplies by freight, and on these roads it is the practice for the foremen to ship all of their surplus tools and those requiring repair to the stores department, also by freight.

On the road with which I am connected, the stores department turns all tools in need of repairs over to the mechanical department for further handling. We have found a number of cases in which tools have not been repaired satisfactorily or tempered correctly. We made no inspection of the tools until they were delivered on the job as we had no opportunity to do so. The stores department, however, should assign a man qualified to make such inspection of all tools that have been repaired.

Repaired tools should be reissued on requisition. This will eliminate the necessity for keeping a record of the tools that are shipped in for repairs, and workmen will not be delayed or interfered with while waiting for the tools to be repaired. However, if special tools are sent in for repairs, the division storekeeper should be notified immediately so that they will be returned to the gang that uses them.

Adhere to Standards

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Suitable and safe tools must be provided for safe and economical work. Repaired tools should be as good as new ones, and must, therefore, be repaired under specifications that correspond with those of the original manufacturer. For this reason, the purchasing and stores departments should handle repaired tools and reissue them in the same manner as new tools.

Irrespective of where the tools are repaired or who repairs them, the same standards and specifications should be adhered to. Tools needing repairs should be collected at a convenient point, sorted and classified as to the character of the repairs or type of work needed, and sent to the particular shops that handle these classes of work. All repaired tools should meet the requirement that they be fit for use on any section or by any extra gang.

The special alloy tool steels that are used in modern tools have largely done away with the old hammer and anvil method of tool repairs. Such work can best be done now in a shop equipped to turn out uniform products on an assembly-line basis. Electric or gas heating and welding may play no small part in repairing and reshaping tools.

There may be isolated cases where track tools could be sharpened and refaced in a local shop and kept in stock locally. In such places, however, periodical inspection should be made by responsible persons, and when the condition of the tools warrant, those that need to be brought back to acceptable standards should be sent to a shop for reshaping or repair.

How to Renew a Tank Post

What procedure should be followed when renewing one or more posts under a wooden water tank? What precautions should be observed?

Take Out One at a Time

By Supervisor of Water Service

When renewing posts under a wooden tank, it is the usual custom to place vertical timbers under the caps at points adjacent to the defective post and use jacks to lift the tub slightly to allow the removal of the old post and the insertion of the new one. Only one post should be removed at a time. The new one should be placed in its final position, with braces bolted in place before starting to remove another post. One jack may be sufficient when renewing center posts, but two jacks should be used when replacing outside or corner posts. It is desirable to use two jacks in all cases, however, if possible, and if it does not interfere with the work of placing the post in position, two jacks will give a better distribution of the load and will cause less strain on the tub.

Sometimes posts may be repaired by cutting off their defective ends and splicing them with sound timber. In this, the same procedure should be followed as in applying a new post. A bolted dapped splice should be used when splicing posts, since this type is stronger, neater in appearance and less susceptible to decay than a butt splice. The length of the splice should be twice the thickness of the post. Three bolts of ample size, usually ¾ or ⅞ in. in diameter, should be sufficient to hold the splice in place. All cut surfaces should be swabbed with hot creosote.

If several posts are spliced, auxiliary bracing should be provided, preferably across the splices. Where more than one post is repaired by splicing, the daps should be at right angles in alternate posts. For temporary repairs, a false or helper post can be placed alongside the defective post until permanent repairs can be made. The level of the water in the tank should be lowered while posts are being renewed to reduce the load on the jacks and lessen the strain on the tank. The lift should be only enough to permit the placing of the post or splice in position.

Must Avoid Settlement

By E. M. Grime
Engineer Water Service, Northern Pacific, St. Paul, Minn.

When a post under a water tank fails by crushing at or near the bottom, as it does in almost all cases of post failure, it allows the tank to settle a certain amount directly above the post. This settlement, which may vary from a small amount to one inch or more, causes the floor boards and staves of the tank to change their original position slightly and thus creates a tendency to leak. For this reason, before the timber is cut for the replacement post, an effort should be made to determine just how much settlement has taken place because of the defective post. A new one should then be cut of the exact length necessary to support the tank fully when it is jacked back to its original position.

In case the tank has a low substruc-

ture, say about 16 ft. high, it is usually more economical to renew the entire post than to splice it. For frames 28 to 40 ft. high, the stubbing of the lower 3 to 6 ft. of the post is good practice. The stub may be cut to a half joint in the original post and be bolted securely in place or the joint may be a horizontal cut with a 3-in. plank about 4 ft. long bolted on each side of the joint.

Failure of one or more posts in the substructure of a wooden tank is one of the most frequent causes of the shortened life of the entire structure, because the alternate wetting and drying of the timber caused by leakage is extremely detrimental. If timber, especially in the large sizes used for tank posts, can be kept dry most of the time, it will outlast by many years those timbers that are subject to continual wetting through tank leakage. This is well illustrated by the fact that timber has an average life of about seven years in Iowa and Minnesota, and even less in the humid atmosphere of the Pacific coast, compared with 20 to 30 years in the arid sections of North Dakota, Montana and Washington.

No feature of the maintenance of tanks supported on wooden substructures is more important than that of making certain that they are constructed in the first place on non-yielding foundations and that the posts and bracing are then kept well painted and as dry as practicable. Having made sure of these essentials, the vital requirement is that the posts be inspected rigidly at frequent intervals and that they be replaced or stubbed before crushing becomes sufficiently serious to allow any settlement of the tub.

Locomotive-water storage tanks are usually in continuous use and no reliable workman undertakes repair work of this nature, which is sufficiently extensive to affect the safety of the structure, without first arranging that the amount of water carried in storage be held at a reduced volume until the repair work to the tank substructure has been completed.

Patching Concrete Floors

What is the most satisfactory method of patching concrete floors? Does the service required of the floor make any difference?

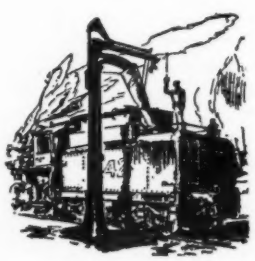
Vary in Requirements

By M. Hirschthal
Concrete Engineer, Delaware, Lackawana & Western, Hoboken, N. J.

What we usually term patching of a concrete floor may range from the filling of a small hole to the complete resurfacing of the entire floor area. The cause of the wear or deterioration of the concrete should be studied to determine whether it was the result of poor workmanship, poor materials or of selecting the wrong class of concrete for the service it was to perform. If the original floor finish was designed for ordinary service, but was later subjected to heavy loads and iron wheels, and will continue to be subject to this more severe service after repairs are made, it will probably be desirable to resurface the entire floor area with a finish suitable for this service, even though only a small part of the area is now affected.

Perhaps the best method for repairing this type of floor is that one which depends on the use of a "burlap blotter" to absorb excess water. This method, which was patented many years ago, so that it is believed that the patent has expired, consists of thoroughly cleaning the surface to be patched and roughing it. The surface is well wetted and cement grout is broomed on, especially at the corners and for a short distance beyond the end of the work to be done in a given period. The concrete should consist of one part of cement, one part of hard sharp sand and one to two parts of grit, that is, stone from hard rock that has been crushed to not more than one-third the thickness of the floor finish.

For these thin sections an excess of water is required for workability. To prevent weakening of the concrete by this excess of water, burlap is spread over the surface of the newly-placed concerte and cement or sand, or both, is spread over the burlap, thus absorbing the water blotter fashion, reducing the water cement ratio to provide a strong dense concrete. When this absorption is completed the burlap, together with the sand and cement, is removed and the surface is floated and then finished with a steel trowel. It is important that the burlap be interposed between the dry sand and cement and the newly placed concrete.



Any number of proprietary methods of patching and resurfacing floors are on the market, some claiming perfect results even for feather edges, but all of them require absolute cleanliness of the surface to be patched and meticulous care in the application of the patch. Fluosilicates are used as liquid surface hardeners as well as for protection against dusting. Another proprietary method withdraws the excess water by a vacuum process, using suction mats on the freshly-placed concrete. Either large or small patches can be made by the foregoing methods. For floors that are not subject to heavy wear, a mortar made of one part of cement and two parts of sand may be used, with such variations between the two extremes as may be necessary to correspond with the severity of the service on the floor.

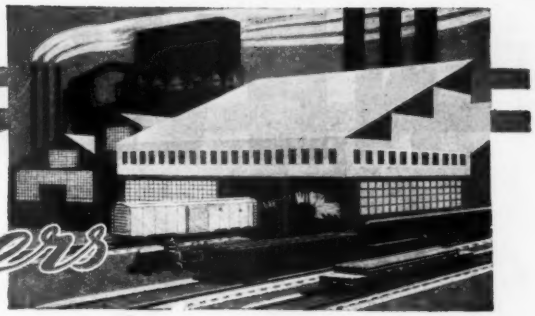
Two dangers attend the patching of concrete floors, namely, failure of the bond between the new and old concrete and the effect of shrinkage stresses as the new concrete sets, which may cause the new concrete to tear away from the old or to crack the old concrete. Cleanliness and wetting of the surfaces to which the concrete is to be applied is the remedy for the first trouble; that for the second is the formation of a sharp line of demarcation in forming the joints between the new and the old concrete. Aggregates that have less than normal shrinkage are also helpful, although they are also proprietary.

Not Specially Difficult

By General Inspector of Buildings

Concrete floors can be patched successfully if the surfaces of the old concrete are prepared suitably, that is, if the depth of the patch is not less than one inch; if the edges of the area are sharply defined and undercut; and if the surfaces of the old concrete are clean and wetted practically to the point of saturation. The mortar should be made of one part of cement to two parts of clean, sharp, hard sand, mixed with water approximating one-third the weight of the cement. It should be tamped in place until water flushes to the surface, and then finished in the usual manner.

PRODUCTS of Manufacturers



Mole Is Improved

THE Railway Maintenance Corporation, Pittsburgh, Pa., has completely redesigned its Mole ballast cleaner to incorporate a number of improvements as compared with previous models, and is now building the units in two sizes, the larger of which is designed to clean ballast in the inter-track space with track centers varying from 13 ft. to 15 ft., while a smaller unit is comparable in size to the former model. Both models, with modifications, can be used for both inter-track and shoulder cleaning. Among the important changes incorporated in both models is the addition of a 25 per cent larger engine with an electric starter.

Both models incorporate substantially the same mechanical features, and both of the shoulder Moles are designed without a swing conveyor at the rear, having instead a side-dump chute for handling the dirt directly from the shaker screen. It is claimed that the large Mole will handle from 25 per cent to 50 per cent more ballast than the old Mole, and that the small model will handle about 20 per cent more. Many improvements have been made in the design, which are said to increase the life of the machine parts and to facilitate maintenance.

Airco Three-Purpose Welding Electrode

THE Air Reduction Company, New York, has developed a new combination-type arc-welding electrode, Airco No. 315, designed to produce horizontal fillet welds with flat or slightly concave profiles, concave fillet welds in the flat position, and deep fillet and deep groove welds. The No. 315 electrode can be used for any job that calls for a 6020 or 6030 electrode and may be applied with either alternating or direct current, and straight or reverse polarity. The usual applications for this electrode include heavy machine weldments and structural or heavy steel assemblies where high weld quality is important, such as trusses, built-up girders and connections.

The No. 315 electrode produces a steady, forceful spray-type arc and a thick porous slag which completely covers the weld deposit under practically every condition of application, and which can be readily removed. It may be used with conventional welding technique and normal currents, under which conditions medium penetration is obtained. Deeper penetration can be secured, however, by using a deep-fillet technique and high currents, as recommended.

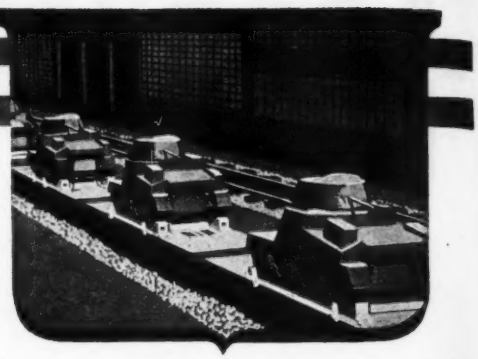
Plastic Gasket

THE Flexrock Company, Philadelphia, Pa., has developed a material called Plastic Gasket, which can be applied to the surfaces of pipe joint flanges in a layer about 1/64 in. thick or on both sides of ordinary gaskets, as a substitute for ordinary gaskets or to increase the effectiveness of the gaskets. This gasket material is impregnated with a non-volatile, non-drying lubricant so that, it is claimed, joints sealed with it will not freeze and can be broken at any time, yet will be securely sealed against vibration, contraction and expansion. It is also claimed that this material will preserve gaskets; will prevent leakage, oxidation and corrosion; will not dry out, burn out or blow out; and is unaffected by temperature and pressure.

Plastic Gasket is manufactured in three different grades and densities for various services as follows: No. 20 for lines carrying hot or cold water, steam, brine, air, gas and ammonia; No. 40 for lines carrying hot or cold oil, gasoline or other petroleum products; and No. 60 (dielectric), which is especially recommended for installation in electrical equipment. Plastic Gasket may be applied with either the fingers or a knife, and five pounds will cover about 5,950 sq. in. of surface. It is available in 5- and 10-lb. cans, or it may be obtained in bulk.

One of the New Shoulder Moles

NEWS of the Month



Road Handles Record Troop Movement

The largest single rail movement of troops during the war was handled during a nine-hour period starting at 8 p.m. on August 3, when more than 20,000 men left the Camp Kilmer, N. J., "staging area" for the Port of New York, en route to 22 different Army reception stations throughout the country. To accomplish this move, the railroads provided 31 trains, including 331 sleeping cars, 100 coaches and 41 kitchen cars. Starting at 8 p.m. on August 3, troop trains departed at an average rate of one every 17 minutes until 4:40 a.m. August 4, when the last train had left.

Tie Renewals Increase 5.8 Per Cent During 1944

Despite the difficulties that continued to influence the procurement of crossties and the continuous shortage of maintenance labor with which the railways were confronted, Class I railroads' tie renewals totaled 48,054,802 in 1944, an increase of 2,615,290, or 5.8 per cent, over 1943 renewals, according to a recent report compiled for the Committee on Ties of the American Railway Engineering Association by the Bureau of Railway Economics.

Analysis of the data indicates that treated ties were used exclusively on 71 of the 134 roads reporting, as compared with 50 roads in 1943, and that only four roads, the same number as in 1943, did not use any treated ties. Relatively, the percentage of treated ties applied in 1944 represented 93.4 per cent of the total, compared with 91 per cent in 1943.

$325,000,000 Net Income For First Six Months of 1945

Class I railroads in the first six months of this year had an estimated net income, after interest and rentals, of $325,000,000, as compared with $322,533,400 in the first half of 1944, according to the Bureau of Railway Economics of the Association of American Railroads. During this period operating revenues increased from $4,636,071,620 in the first six months of 1944, to $4,699,870,508 in 1945, an increase of 1.4 per cent, while operating expenses rose 3.8 per cent, from $3,077,777,848 in 1944 to $3,195,745,900 during 1945. The tax bill for the first six months of 1945 totaled $875,634,002, or about two and one-half times net income for the period, although this total represented a considerable reduction from 1944's first six months taxes of $908,937,391.

Reserve Status to Be Given Railway Operating Battalions

As the Army is demobilized, technical units which were sponsored and manned by civilian institutions, such as railway operating and shop battalions, will not be disbanded, but will be continued on an inactive reserve basis as a part of the peace-time military establishments, according to a recent announcement of the War Department.

In its statement the War Department said: "Continued sponsorship of units by business firms and institutions during the post-war period will not only preserve interest in national security, but will also speed the reactivation of units whenever necessary."

Glass Dome Car Designed For Passenger Train Service

A radically new passenger train design, named the "Astra Liner," has been developed by the Electro-Motive division of General Motors and will be built as soon as facilities become available. While the new train incorporates many new features, the most striking is the provision of a glass-enclosed, steel-ribbed dome on each car which enables passengers to enjoy an unobstructed view in all directions. Following the completion of the designs, the Burlington removed one of its streamlined passenger coaches from service and remodeled it to incorporate the observation dome, placing the car in experimental service on various trains in order to observe the reaction of the traveling public.

French Honor M.R.S. Officers

Brig. Gen. Carl R. Gray, Jr., director general 2nd M.R.S., and Brig. Gen. Clarence L. Burpee, commander of the 2nd M.R.S., received one of the most cherished of French military decorations, the Croix de Guerre, in Paris on July 19.

Other M.R.S. officers, including 15 railroaders, honored at the ceremony include:

Croix de Guerre with palm: Col. S. H. Bingham, New York (N.Y. Subway); Col. Benj. H. Crosland, Ft. Scott, Kan. (S.L.-S.F.); Col. L. E. Covin, Waycross, Ga. (A.C.L.); Col. W. S. Carr, West Haven, Conn. (N.Y.N.H.&H.); Col. L. G. Jamison, Jersey City, N.J. (P.R.R.); Col. A. E. Stoddard, Cheyenne, Wyo. (U.P.).

Croix de Guerre with gold star: Lt. Col. H. G. Dennis, St. Paul, Minn. (C.R.I. &P.); Col. B. H. Decker, Salt Lake City, Utah (D.&R.G.W.); Lt. Col. E. E. Foulks, Los Angeles, Cal. (A.T.&S.F.); Col. O. W. Kempster, Peoria, Ill.; Lt. Col. C. S. Sanderson, Augusta, Ga. (A.C.L.); Maj. H. T. Ankerson, El. Paso, Tex. (S.P.); Maj. W. L. Hartzog, Wilmington, N. C. (A.C.L.).

Croix de Guerre with silver star: Capt. J. G. Beard, Amherst, Va. (Sou.); Capt. J. L. Bean, Sorento, Ill. (N.Y.C. & St.L.); Capt. V. D. Raessler, Cherokee, Ia. (I.C.); and 1st Lt. J. T. O'Neil, Kansas City, Mo. (A.T.&S.F.).

W.P.B. and O.D.T. Ease Controls

The end of hostilities in the Pacific, on August 14, marked the beginning of a period of rapid relaxation of controls affecting the railways and their competitors in the fields of man-power and materials, as well as in transportation services. So far as man-power is concerned, all controls have now been lifted except over wages, and these have been relaxed to permit wage increases, providing the sales price of the product is not raised as a result of pay adjustments. At the same time, it was announced that many war plants would be closed, thereby ending the intensive competition for available labor and releasing many persons for other employment.

The War Production Board has announced that, on September 30, its Controlled Materials Plan will be revoked as a whole. In the meantime, some 210 individual material controls were cancelled, including those relating to the manufacture of trucks, those covering used rail and rail joints, and those designed to eliminate cross-hauling in the interest of conserving transportation.

In the field of transportation services, the Office of Defense Transportation cancelled the orders banning resort trains and lightly patronized passenger trains. The order covering the use of tank cars for the transport of petroleum products was also revoked, permitting the railroads to compete again for short-haul petroleum traffic. Numerous travel bans were also lifted by the O.D.T., including those prohibiting group travel for business or professional purposes, restrictions on the transportation of race horses and show animals, and travel by athletic teams. The convention ban was continued, but relaxed sufficiently to permit gatherings up to 150 persons.

TIE-TAMPING "On the Double"

with the SCHRAMM 315 Cu. ft (24 tool) CRAWLER

USING up to 24 tampers and this SCHRAMM Crawler compressor, a large Eastern road speeds maintenance on its mainline tracks. While the compressor is usually spotted close to the work on the shoulder, it is interesting to note that it can also deliver its air from the foot of the hill through a longer pipe connection. Moving the Crawler up or down a 45 degree slope presents no problem; its tank-like treads easily negotiate the steepest hills, the wildest deepest ditches.

While the Crawler is the most adaptable of track maintenance compressors, it is only one of the mountings in which SCHRAMM gasoline and Diesel powered compressors are available. The full line includes tractor, trailer, and rail car mountings in capacities from 60 to 420 cubic feet actual air per minute. Get your copy of circular RM 44 describing various types. SCHRAMM, INC., *The Compressor People*, West Chester, Pennsylvania.

SCHRAMM AIR COMPRESSORS FOR RAILROAD MAINTENANCE

Changes in Railway Personnel

General

R. C. Sabens, supervisor of maintenance of way, shop and equipment, of the New York, Chicago & St. Louis, at Bellevue, Ohio, has been promoted to safety and fire prevention agent. **C. G. Mitchell** has been appointed supervisor maintenance of way, shop and equipment, succeeding Mr. Sabens.

George S. Douglas, whose appointment as director of the Bureau of Valuation of the Interstate Commerce Commission was reported in the August issue was born at Beattie, Kan., on July 15, 1895, and was graduated from Kansas State Agricultural College with the degree of B.S. in Civil engineering. On July 29, 1916, he entered the employ of the Bureau of Valuation. After military service during World War I, he assisted in inventorying the physical properties of railroads in the Western district, making his headquarters

George S. Douglas

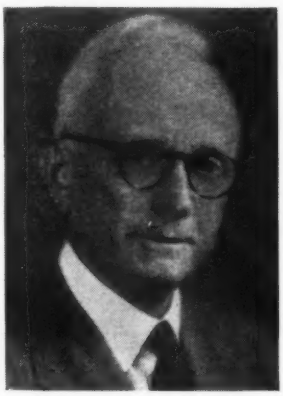
at Kansas City, Mo. Late in 1921, Mr. Douglas was transferred to Washington, D.C., to assist in the preparation of the basic engineering valuation and recapture reports and to defend them in hearings. Since 1933 he has been engaged in the general work of bringing forward the engineering inventories and preparing special reports for use in reorganization and rate cases. He was promoted to assistant head valuation engineer of the bureau in 1942.

David A. Ruhl, whose promotion to superintendent of maintenance and operations of the LaSalle St. Station, Chicago, of the Chicago, Rock Island & Pacific and New York Central, was reported in the August issue, was born at Des Moines, Iowa, on March 4, 1896, and was graduated from Cornell University. He entered the service of the Rock Island on July 1, 1924, as a rodman in the engineering department at Des Moines, and on March 23, 1925, he was promoted to instrumentman at Chicago, several months later being promoted to senior instrumentman. On April 15, 1926, he was advanced to assistant engineer, and on January 1, 1929, he was appointed acting division engineer at Chicago. Mr. Ruhl was re-appointed assistant engineer on January 1, 1931, and on February 1, 1932, he was appointed rodman. On March 1, 1932, he was

David A. Ruhl

appointed a track supervisor on the Illinois division, and on May 21, 1934, he returned to his former position as assistant engineer on the Chicago Terminal division. On October 1, 1935, he was appointed general foreman at the Chicago terminal, and on August 21, 1937, he was promoted to stationmaster of the LaSalle Street station. Mr. Ruhl was advanced to general building inspector, with headquarters at Chicago, in September, 1939, and in April, 1940, he was promoted to engineer of buildings, the position he held at the time of his new appointment.

Robert A. Lacey, whose retirement as director of the Bureau of Valuation of the Interstate Commerce Commission was



Robert A. Lacey

reported in the August issue, was born in Bolton, Miss., and entered the service of the commission in 1914, becoming a pioneer in the work of establishing basic valuations of railroads. He served in turn as assistant field leader, field leader and later was placed in charge of valuation accounting in the Southern district, with headquarters at Chattanooga, Tenn. Upon completion of the basic field work in this area, he was transferred to Washington, D.C., to prepare and defend valuation accounting reports on roads in the Southern district. In 1926 Mr. Lacey was made assistant in charge of completing valuation accounting reports for railroads of the entire country, and in 1933 he was made head auditor of property changes. He was made director of the Bureau of Valuation September 1, 1943.

G. H. Harris, whose retirement as assistant to the vice-president of the New York Central Lines, West of Buffalo, was reported in the August issue, was born at Toledo, Ohio, on July 17, 1878, and received his engineering education at the University of Michigan. He entered railway service in 1901 on the construction of the Detroit and Toledo Shore Line, and in 1902, he became an assistant in the engineering corps of the Pennsylvania at Chicago. A year later Mr. Harris joined the engineering organization of the Michigan Central as an assistant engineer, and in 1905 he was promoted to division engineer, with headquarters at Niles, Mich., but was reappointed assistant en-

G. H. Harris

gineer with headquarters at Detroit in 1906. From 1907 to 1910, he was assistant engineer in charge of the grade separation project of the Michigan Central and the Chicago, Rock Island & Pacific at Joliet, Ill., and in the latter year he was promoted to division engineer at St. Thomas, Ont. In 1912 Mr. Harris was transferred to Detroit, and in 1913 he was appointed engineer of track, which position he held for three years before being advanced to engineer maintenance of way. During the period between 1917 and 1919, he was acting assistant chief engineer, and in the latter year was appointed special engineer. He served as engineer maintenance of way in 1920-1921 and was promoted to assistant chief engineer in the latter year. On November 1, 1931, Mr. Harris was promoted to chief engineer of the Michigan Central, with headquarters at Detroit, and on October 1, 1939, he was advanced to chief engineer of the New York Central, Lines West of Buffalo (including the Michigan Central), with headquarters at Chicago. One year later, his jurisdiction was extended to include the Big Four and the Peoria &

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Eastern (also controlled by the N.Y.C.), and in April, 1943, he was advanced to the position he held at the time of his retirement.

John Wheeler, who has been on military leave of absence, has returned to his position as executive assistant of the Chicago, Burlington & Quincy, at Chicago. Mr. Wheeler, who was formerly assistant chief engineer of the Burlington lines, served as commanding officer of the 113th Engineers, National Guard, with the rank of Colonel and was called to active duty in January, 1941. Under his direction the regiment built the first airport on Hudson's Bay in 1942. Col. Wheeler later supervised construction on the Alcan highway, between Alaska and Canada, and on the Lido road in the India-Burma theater. On January 5, 1944, he was appointed chief engineer of the 16th Corps, serving with this group in France, Belgium, Holland and Germany.

Harry C. Murphy, assistant vice-president (operations) of the Chicago, Burlington & Quincy, the Colorado & Southern, the Fort Worth & Denver City, and the Wichita Valley, and an engineer by training and experience, has been elected

Harry C. Murphy

vice-president of the department of operations of these lines. Mr. Murphy was born at Canton, Ill., on August 27, 1892, and received his higher education at Iowa State College, Ames, Iowa, and at the Armour Institute of Technology, Chicago. He entered railway service with the Iowa Central (now Minneapolis & St. Louis), as a section laborer, helper and agent. In 1914 he went with the Burlington as a clerk in the auditor's office at Chicago, later transferring to the engineering department as a rodman at La Crosse, Wis. During World War I, Mr. Murphy served as a pilot in the United States Army Air Service, returning to the Burlington in 1919 as assistant engineer, at Centralia, Ill., subsequently holding the positions of acting division engineer there, and division engineer at Kansas City, Mo. In August, 1923, he was advanced to assistant engineer maintenance of way at Alliance, Neb., and in April, 1924, he was further advanced to district engineer maintenance of way at Galesburg, Ill. He became engineer maintenance of way at Lincoln, Neb., in February, 1925, and two years later entered the operating department as transportation assistant to the general manager, Lines West, at Omaha, Neb., being transferred to Chicago in October, 1928. From April, 1929 until August, 1933, when he was appointed superintendent of safety, at Chicago, Mr. Murphy was assistant superintendent and superintendent at various points. On May 1, 1936, he was appointed assistant to the executive vice-president of the Burlington system, and a few months later he was elected also president of the Burlington Transportation Company, a motor transport subsidiary, remaining in these two latter positions until 1939, when he was promoted to assistant vice-president (operations), the position he was holding at the time of his recent election.

Engineering

J. A. Blalock, supervisor of track of the Potomac Yard of the Richmond, Fredericksburg and Potomac, at Alexandria, Va., has been promoted to assistant division engineer at that terminal.

H. R. Pratt, chief engineer of the Western Maryland, at Baltimore, Md., has been appointed consulting engineer. **E. Carl Shreve,** engineer maintenance of way, at Baltimore, has been promoted to chief engineer in charge of construction and maintenance. The position of engineer maintenance of way has been abolished.

Theodore H. Krutschnitt, assistant engineer on the Southern Pacific, at San Francisco, Cal., has been promoted to assistant division engineer of the Coast division.

S. G. Smith has been appointed engineer of survey, lands and property, central region of the Canadian National, at Toronto, Ont. The position of regional land surveyor, formerly held by Mr. Smith, has been abolished.

Morris H. Beckman has been appointed assistant engineer of buildings of the Chicago, Rock Island & Pacific, at Chicago, succeeding **T. J. Engle,** whose promotion to engineer of buildings was reported in the August issue.

E. F. Wright, assistant engineer on the Baltimore & Ohio, at Pittsburgh, Pa., has been promoted to regional engineer, with the same headquarters, succeeding **K. J. Wagoner,** assigned to special duties.

St. John Munro, a division engineer on the Canadian National, has been promoted to district engineer of the British Columbia district, with headquarters at Vancouver, B. C., succeeding **S. Morrison,** who has retired. **H. H. Wilkinson,** division engineer at Prince Albert, Sask., has been transferred to Victoria, relieving Mr. Munro.

J. L. Southard, supervisor of track on the Chesapeake & Ohio, at Columbus, Ohio, has been promoted to assistant division engineer, with the same headquarters, succeeding **M. J. Hubbard,** whose promotion to division engineer at Columbus was reported in the August issue.

H. S. Rimmington, assistant engineer, Western region of the Canadian National, has been advanced to bridge engineer of that region, with headquarters as before at Winnipeg, Man. Mr. Rimmington succeeds **William Walkden,** whose retirement was reported last month.

H. F. Smith, assistant division engineer of the Reading, at Philadelphia, Pa., has been advanced to division engineer at Tamaqua, Pa., succeeding **W. S. Sloatman,** whose promotion to assistant superintendent at Reading, Pa., was reported in the July issue. **J. W. DeMoyer,** supervisor of track at West Trenton, N. J., has been advanced to assistant division engineer at Philadelphia, relieving Mr. Smith.

M. S. Miller, whose appointment as engineer maintenance of way of the Reading, at Philadelphia, Pa., was reported

M. S. Miller

in the August issue, was born at Schodack, N. Y., and was graduated from Rensselaer Polytechnic Institute in 1909 with the degree of Civil Engineer. After serving as a draftsman with the American Bridge Company at Pencoyd, Pa., and later working on the building of an elevated railway in Philadelphia, he joined the Reading's maintenance of way department as assistant supervisor, serving at Harrisburg, Pa., Mahanoy Plane, and on the Atlantic City (N.J.) railroad from 1910 to June, 1914, when he was promoted to supervisor at Mahanoy Plane. He was transferred to Philadelphia subsequently, and in November, 1923, was appointed division engineer at Harrisburg, later returning to Philadelphia in the same capacity. Mr. Miller was named acting engineer maintenance of way, at Philadelphia, in August, 1943, and retained that title until his recent appointment as engineer maintenance of way.

Frederick S. Wilkins, whose retirement as division engineer of the Island division of the Canadian National, with headquarters at Charlottetown, P. E. I., was reported in the June issue, was born at Belgrave, Ont., on April 11, 1880, and entered C. N. R. service as a draftsman at Moncton, N. B., on November 6, 1913. In 1920 he was advanced to second assistant engineer at Moncton, and in 1927 to division engineer at Charlottetown.

C. J. Jaeschke, division engineer of the Missouri Pacific, at Kansas City, Mo., has been transferred to the Omaha-

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Northern Kansas divisions, with headquarters at Falls City, Neb., succeeding **W. Rambo,** who has been transferred to the Central Kansas-Colorado divisions, with headquarters at Osawatomie, Kan. He replaces **C. E. Cherry,** who has been transferred to the Joplin-White River divisions, with headquarters at Nevada, Mo., relieving **G. L. Brown,** who in turn succeeds Mr. Jaeschke as division engineer of the Eastern and Kansas City Terminal divisions at Kansas City.

Fred E. Tardy, whose promotion to assistant division engineer of the Tucson division of the Southern Pacific, at Tucson, Ariz., was reported in the July issue, entered the employ of the Southern Pacific in June, 1941, as a draftsman at Tucson, serving subsequently as instrumentman and junior engineer at that point. In November, 1942, he was advanced to general foreman, remaining in that position until his recent appointment, except for the period from May, 1943, to February, 1944, when he served as relief roadmaster.

D. M. Trotter, whose appointment to the position of division engineer of the Hornepayne division of the Canadian National, Hornepayne, Ont., was reported in the June issue, was born in Scotland on June 28, 1903, and attended Coatbridge Technical College. He entered railway service in 1926 as a chainman on the Canadian National at Capreol, Ont., and was promoted two years later to instrumentman at Hornepayne. In 1940 he was appointed assistant roadmaster at Allandale, Ont., and in 1942 was advanced to roadmaster, with the same headquarters. Mr. Trotter was appointed assistant division engineer at Hornepayne in 1943.

A. C. Wessell, whose promotion to assistant engineer of buildings of the Atlantic Coast Line, at Wilmington, N.C., was reported in the June issue, was born on March 17, 1908, and was graduated in 1930 from the Georgia School of Technology with a B.S. degree in architecture. He entered railway service on January 1, 1941, as a draftsman on the Atlantic Coast Line and was promoted to junior engineer on July 1, 1941. Three months later, Mr. Wessell was appointed assistant engineer, and on February 1, 1945, he was promoted to senior assistant engineer, which position he held until his recent promotion.

John L. Charles, whose promotion to chief engineer, Western region, of the Canadian National, with headquarters at Winnipeg, Man., was reported in the July issue, was born at Weybridge, England, on December 15, 1892. He entered railway service in 1910 as a rodman on the Grand Trunk Pacific (now the Canadian National) and a short time later he went with the Hudson Bay (a part of the Canadian National). He served overseas during World War I and returned to the Canadian National in 1919 in charge of branch lines. In 1923, Mr. Charles was promoted to terminal engineer on construction at Ft. William, Ont., and in 1927 he returned to the Hudson Bay. A short time later he was advanced to supervising engineer on location for the Western region, and held that position until being called into military service by the Royal Canadian Engineers in the present war. Mr. Charles returned to the Canadian National in 1943 and shortly thereafter was promoted to principal engineer, Western region, the position he held at the time of his new appointment.

Track

P. Demos, a section foreman on the Rapid City, Black Hills and Western, at Big Bend, S. D., has been promoted to roadmaster, with headquarters at Rapid City, S. D.

Malcolm E. Condon, general foreman on the Erie, at Jersey City, N. J., has been promoted to track supervisor at Campbell Hall, N. Y., succeeding **J. T. Flynn,** who has been transferred to Mansfield, Ohio.

R. E. Koontz, general foreman of a system extra gang on the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to roadmaster, at Austin, Minn., succeeding **F. J. Kovaleski,** assigned to other duties.

S. C. Shelton, roadmaster on the Missouri & Arkansas, at Harrison, Ark., has been transferred to Searcy, Ark., succeeding **O. Ahlstrand,** who has resigned. **W. R. Davison** has been appointed roadmaster at Harrison, relieving Mr. Shelton.

C. W. Butcher, assistant supervisor of track on the Chesapeake & Ohio, at Marion, Ohio, has been promoted to supervisor of track of the Columbus terminal, with headquarters at Columbus, Ohio, succeeding **J. L. Southard,** whose promotion to assistant division engineer at Columbus is reported elsewhere in these columns.

C. O. Enlow, roadmaster on the Atchison, Topeka & Santa Fe, who has been on leave of absence because of ill health, has been appointed roadmaster at Lubbock, Tex., succeeding **R. D. Bisbee,** who has been transferred to Woodward, Okla., relieving **H. F. Curtis,** assigned to other duties.

H. H. Hopkins, Jr., assistant supervisor of track at the Potomac Yard of the Richmond, Fredericksburg and Potomac, has been promoted to supervisor of track, with headquarters as before at Alexandria, Va., succeeding **J. A. Blalock,** whose promotion to assistant division engineer is reported elsewhere in these columns.

D. E. Cowell, acting supervisor of track on the Reading, at Lansdale, Pa., has been promoted to supervisor of track at West Trenton, N.J., succeeding **J. W. DeMoyer,** whose promotion to assistant division engineer at Philadelphia, Pa., is reported elsewhere in these columns. **O. H. Rhoads,** assistant supervisor of track as Lansdale, has been advanced to supervisor of track at that point, replacing Mr. Cowell.

T. L. Davis, supervisor of track on the Louisville & Nashville, at Irvington, Ky., has been transferred to Madisonville, Ky., replacing **C. N. Petty,** who has been transferred to Bay St. Louis, Miss., succeeding **W. R. Cagle,** who has resigned. **Raleigh Choate** has been appointed track supervisor at Irvington, succeeding Mr. Davis. **R. R. Young** has been appointed track supervisor at Georgiana, Ala., succeeding **H. I. Welcker,** whose death is reported elsewhere in these columns. **Ervine Allen** has been named track supervisor at Jackson, Ky., replacing **J. E. Busby,** who has resigned.

J. O. Franklin, track supervisor on the Arkansas division of the Chicago, Rock Island & Pacific, has been promoted to roadmaster, with headquarters as before at Little Rock, Ark. **B. J. Ellerd,** track supervisor at El Reno, Okla., has been advanced to assistant roadmaster, with the same headquarters, a newly created position. **R. S. Buskovick,** assistant roadmaster on a system steel gang, has been appointed assistant roadmaster at Bureau, Ill., a new position. **Noble Hurt,** track supervisor at Topeka, Kan., has been promoted to acting roadmaster at that point, relieving **Hugh Price,** who has been granted a leave of absence because of ill health. **R. P. Scott,** assistant roadmaster on a system steel gang, has been advanced to acting roadmaster at Chickasha, Okla., succeeding **John Gardner,** who has accepted a leave of absence due to illness.

Bridge and Building

Francis B. Peter, office engineer of the Western division of the Southern Pacific, has been promoted to division fire inspector, with headquarters as before at Oakland Pier, Cal.

D. Braithwaite, a bridge and building foreman on the Rapid City, Black Hills and Western, has been promoted to supervisor of bridges and buildings, with headquarters as before at Rapid City, S.D.

P. F. Sitcer, bridge and building foreman on the River division of the New York Central, at New York, has been promoted to assistant supervisor of bridges and buildings of the division, with the same headquarters, succeeding **R. L. Robins,** deceased.

L. F. Rapier, master carpenter of the Western division of the Alton, at Bloomington, Ill., has been promoted to supervisor of bridges and buildings of the entire line, with headquarters at Chicago. **R. E. Ventress,** a bridge carpenter foreman on the Eastern division, has been advanced to master carpenter of the Western division, with headquarters as before at Bloomington.

F. D. Day, bridge and building apprentice on the New York division of the Pennsylvania, has been promoted to assistant master carpenter on that division, with headquarters at Jersey City, N.J., instead of David McKibben, as reported erroneously in the August issue. Mr. Day succeeds **N. I. Huntley, Jr.,** whose promotion to master carpenter at Terre Haute, Ind., was reported in that issue.

Harry C. Crawford, bridge and building supervisor of the Shasta division of the Southern Pacific, at Dunsmuir, Cal., has been transferred to the Western division, with headquarters at Oakland Pier, Cal.

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Arthur A. McDermott, general bridge and building foreman on the Salt Lake division, has been promoted to bridge and building supervisor at Dunsmuir, replacing Mr. Crawford. **John D. Trulove,** assistant bridge and building supervisor of the Salt Lake division, has been advanced to general foreman, succeeding Mr. McDermott. Mr. McDermott entered the employ of the Southern Pacific in May, 1919, as a carpenter helper on the Salt Lake division. In June, 1920, he was promoted to carpenter, advancing to bridge and building foreman in 1922. He was named general foreman in October, 1943, remaining in this position until his recent promotion.

Donald M. Yaw, whose promotion to master carpenter of the Buffalo and Rochester divisions of the Erie, at Buffalo, N.Y., was reported in the July issue, was born at Little Valley, N.Y., on February 4, 1900, and entered railway service on October 3, 1923, as a plumber's helper on the Erie at Salamanca, N.Y. On April 6, 1926, he was advanced to plumber, and on March 26, 1930, was promoted to plumber foreman on the Wyoming division at Dunmore, Pa. Mr. Yaw was further advanced on May 22, 1944, to assistant master carpenter of the Mahoning division, with headquarters at Youngstown, which position he held until his recent promotion.

Norman L. Huntley, Jr., whose promotion to master carpenter of the St. Louis division of the Pennsylvania, at Terre Haute, Ind., was reported in the August issue, was born at Philadelphia, Pa., on December 26, 1905, and was graduated from Pennsylvania State College in 1928. He entered railway service in February, 1929, as an assistant on the engineering corps of the Long Island (a subsidiary of the Pennsylvania), serving subsequently as assistant crossing inspector, draftsman and welder foreman. From August, 1937, to March, 1942, he served as draftsman, rodman and inspector in the office of the chief engineer of the New York zone of the Pennsylvania, following which he was granted a three months' furlough to aid in the construction of facilities at Camp Kilmer, at Stelton, N.J. In July, 1942, Mr. Huntley returned to the Pennsylvania as assistant master carpenter of the New York division, at Jersey City, N.J., remaining in that position until his recent promotion.

Obituary

H. I. Welcker, track supervisor on the Louisville & Nashville, at Georgiana, Ala., died recently.

Walter R. Parvin, chief engineer maintenance of way of the Pennsylvania's Eastern region, with headquarters at Philadelphia, Pa., died on July 28 at Cape Charles, Va.

Robert K. Rochester, who retired on January 1, as assistant to the chief engineer of the Pennsylvania, with headquarters at Philadelphia, Pa., and who served previously for a number of years as assistant to the vice-president in charge of operation of that road, died of a heart ailment at his home in Elizabeth, N.J., on August 18.

Association News

Bridge and Building Association

No changes in plans have been made for the one-day annual meeting of the association, scheduled to be held at the Hotel Stevens, Chicago, on October 17. However, in view of the recent relaxation of O.D.T. orders permitting the attendance of as many as 150 out-of-town members at such meetings, it is hoped by the Executive committee that many out-of-town members will plan to attend the meeting on October 17.

The program for the meeting will include the presentation and discussion of eight technical committee reports, election of officers for the ensuing year, and, if time permits, a roundtable discussion of the most pressing questions before members at the time.

Maintenance of Way Club of Chicago

Plans are progressing toward the resumption of an interesting series of meetings of the club, beginning with the first, to be held on October 22. Following a meeting of the Executive committee in July, President C. C. Pelley has announced the chairmen of standing committees for the ensuing year, as follows: Program committee—F. G. Campbell, asst. ch. engr., Elgin, Joliet & Eastern; Membership committee—J. E. Fanning, asst. ch. engr., Illinois Central; Registration committee—Charles F. Reade, rep., Reade Manufacturing Company; Speaker's Table committee, W. G. Arn, spec. engr., Illinois Central; Dinner Arrangements committee—G. E. Johnson, adv. mgr., P.&M. Company; and Finance committee—W. S. Lacher, secy., American Railway Engineering Association.

Already active, the Program committee has met twice, and has arranged highly interesting tentative programs for the first three fall meetings. The Year Book of the club is in the process of being republished, with the expectation that it will be ready for distribution early in October, and in this connection it is being asked that members advise the secretary promptly of changes in titles and address which may have occurred during the year.

American Railway Engineering Association

To date four committees have scheduled meetings to be held in September, these being the Committee on Track, which will meet at the Palmer House, Chicago, on September 13, the Committee on Roadway and Ballast, which will meet in Chicago, also at the Palmer House, on September 18 and 19, the Committee on Yards and Terminals, which will meet at Cleveland on September 25, and the Committee on Economics of Railway Location and Operation which will meet at the Palmer House, Chicago, on September 26. The Subcommittee on Trackwork Plans of the Committee on Track will meet at the Palmer House a day earlier than the meeting of the full committee.

With the exception of one binding, involving a total of about 500 copies, the 1945 Proceedings, reporting the activities of the Association for the year ending last March, were mailed to members during August. The copies that have not yet been mailed are those with the half leatherette binding, work on these copies having been retarded by a delay in delivery of the proper material for the cover.

Since January 1 there have been 90 new additions to the membership and 10 reinstatements. During the same period there was a loss of 42 members due to various causes, with the result that there has been a net increase in membership this year of 58. The association now has a membership of 2,067, the highest since 1932.

Roadmaster's Association

Plans are completed for the one-day annual meeting of the association to be held at the Hotel Stevens, Chicago, on September 12. The meeting will be held in Room No. 1 on the third floor, and will begin at 9:30 a.m. The program will include essentially an opening statement by President E. L. Banion, the presentation of five technical committee reports, the election of officers for the ensuing year, and the installation of new officers by H. R. Clarke, chief engineer of the Burlington System, and a past-president of the association.

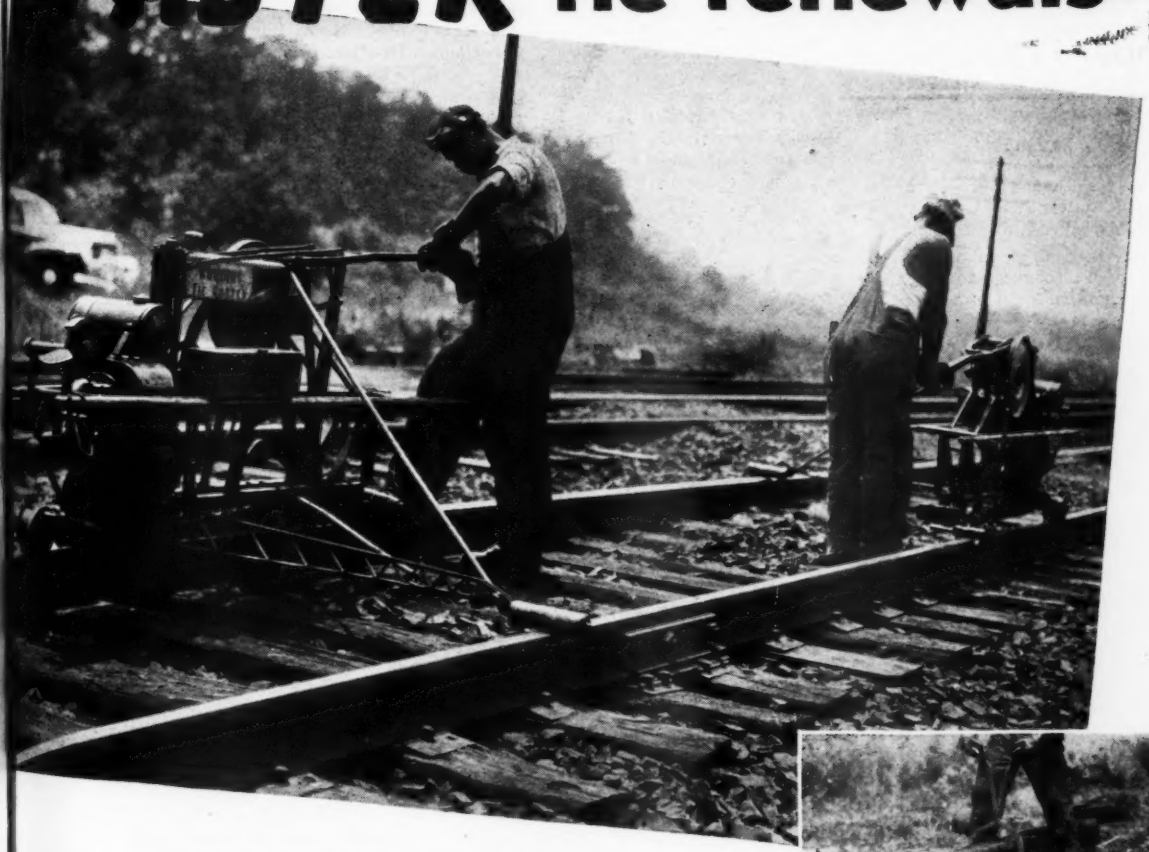
The five technical committee reports, which will be presented in full, followed by discussion, together with the chairmen of the various committees preparing the reports, are as follows: Stabilization of Roadbed—J. R. Rushmer, rdway. engr., A.T.&S.F., Amarillo, Tex.; Field Repairs and Maintenance of Work Equipment, Including Motor Cars—W. E. Chapman, div. engr., C. of G., Columbus, Ga.; Modern Methods of Right-of-way Grading—A. G. Reese, dist. engr., C.B.&Q., Galesburg, Ill.; Prevention of Damage to Rail—J. E. Fanning, asst. to ch. engr., I.C., Chicago; and Yard Maintenance Under Extraordinary Traffic—H. Charles Koch, rdm., Belt Ry. of Chicago, Chicago. If time permits, this part of the program will be supplemented by a general roundtable discussion of questions submitted in advance or from the floor.

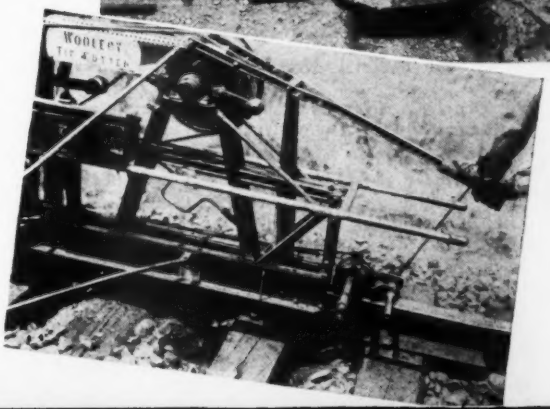
No change has been made in plans for the one-day annual meeting as the result of some relaxation of previous O.D.T. orders covering conventions, raising out-of-town attendance to 150, but it is expected that this relaxation affecting attendance will make it possible for a considerable number of members within easy reach of Chicago to attend.

Snow Melting Systems.—Case Study No. 4, a six-page bulletin published by the A. M. Byers Company, Pittsburgh, Pa., describes five installations of underground steam or hot water pipes for melting the snow off from sidewalks, driveways and trucking ramps. The bulletin also explains briefly the design and installation principles involved in efficient snow removal by this method.

(Continued on page 900)

FASTER tie renewals





with WOOLERY TIE CUTTERS

Tie replacement time, labor and cost are greatly reduced with the use of Woolery Tie Cutters. Two cuts, just inside the rail, are made in the tie with about 20 to 30 seconds required for each cut. The end sections of the tie are easily pried out with a bar, while the center section is removed by lifting out from between the rails. This results in minimum disturbance to the tie bed.

The blade of the Woolery Tie Cutter operates with a reciprocating motion and can make from 50 to 100 cuts before sharpening is necessary.

Hundreds of Woolery Tie Cutters being used by the railroads in America are helping them save up to 30% in tie renewal costs.

Woolery Maintenance Equipment

Tie Cutters **Weed Burners** **Creosote Sprayers**
5-burner, 3-burner, 2-burner and 1-burner models available

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • TIE CUTTERS • TIE SCORING MACHINES • RAIL JOINT OILERS • CREOSOTE SPRAYERS • BOLT TIGHTENERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.

Supply Trade News

Personal

Charles H. Rhodes, vice-president of the **United States Steel Corporation,** at Chicago, has retired.

Lewis A. Harlow, assistant advertising manager of **Fairbanks, Morse & Company,** Chicago, has been promoted to advertising manager.

Thomas R. Clark, who resigned from his position as district representative of the **Caterpillar Tractor Company,** at Minneapolis, Minn., to serve with the armed forces as a tractor specialist, has returned as district representative at Omaha.

Frank B. Nugent, who has represented the Barco Manufacturing Company in the northwest territory for the last 22 years, has organized his own company, the **Frank B. Nugent Company,** with offices in St. Paul, Minn. He will continue to represent Barco, as well as several other manufacturers of railway equipment.

Robert F. Nelson has been appointed vice-president and assistant to the president of **R. G. LeTourneau, Inc.,** Peoria,

Robert F. Nelson

Ill. Mr. Nelson was formerly vice-president and a director of the Arma Corporation, Brooklyn, N.Y.

J. C. Ogden, president of the **Robert W. Hunt Company,** at New York, has been elected chairman of the board of the company, with headquarters as before at New York. **Wm. L. Cooper,** vice-president of the company, at New York, has been elected president, with the same headquarters.

W. E. R. Blood, who has been in charge of the British Army Engineer's headquarters at Washington, D.C., has been appointed managing director of the new factory to be built in England by **R. G. LeTourneau, Inc.,** Peoria, Ill. **Maurice Foote,** superintendent of LeTourneau plant No. 1, at Peoria, has been promoted to plant manager of the new factory.

Hobart C. Ramsey, executive vice-president of the Worthington Pump and Machinery Corporation, Harrison, N. J., has been elected president of the **Ransome Machinery Company,** Dunellen, N. J., a Worthington subsidiary. Mr. Ramsey retains his position as executive vice-president of the Worthington company. **J. G. Ten Eyck,** who was formerly president of Ten Eyck, Inc., and

Hobart C. Ramsey

who, for the last five years, has been serving in the United States Navy, has been appointed vice-president and general manager of the Ransome Company.

Mr. Ramsey was born in Chicago on July 24, 1891, and was graduated from the United States Naval Academy at Annapolis, Md., in 1915. He entered the employ of the Worthington Pump and Machinery Corporation in 1919 and was sent to Europe in 1928 to reorganize the European affiliates of the Worthington company, remaining abroad until 1933. Mr. Ramsey was elected vice-president in 1929, and in January, 1945, he was named executive vice-president.

The functions of the **Armco Railroad Sales Company, Inc.,** a wholly-owned subsidiary of the **American Rolling Mill Company,** have been discontinued, with the result that officers of the former organization have been reassigned to the parent company and to **Armco Drainage & Metal Products, Inc.,** another subsidiary, as follows:

Logan T. Johnston, president and general manager, joins the American Rolling Mill Company as administrative assistant to the sales management, at Middletown, Ohio. **H. M. Arrick,** district manager of St. Louis, Mo., becomes assistant district manager of Armco, with the same headquarters. **Robert Y. Barham,** district manager at Chicago, becomes assistant district manager of Armco, with the same headquarters. **G. Russell Betts,** salesman in the Chicago office, has been promoted to manager of railroad sales, O'Neall division, Armco Drainage & Metal Products, Inc., at Chicago. **Charles M. Colvin,** sales engineer at Berkeley, Cal., becomes sales engineer of the Armco Drainage & Metal Products, Inc., with the same headquarters. **W. N. Crout,** district manager at Cleveland, Ohio, becomes assistant district manager of Armco, with the same headquarters. **W. P. Lipscomb,** district manager at Richmond, Va., has been appointed Armco representative, with the same headquarters. **N. A. Powell,** district manager at Houston, Tex., becomes manager of railroad sales, Southwestern division, Armco Drainage & Metal Products, Inc., at Houston. **W. O. Robertson,** district manager at Philadelphia, Pa., becomes manager of railroad sales, Eastern division, Armco Drainage & Metal Products, Inc., with the same headquarters. **K. A. Smith,** district manager at Berkeley, becomes district manager of Armco Drainage & Metal Products, Inc., at the same point.

Robert H. Gardner has been appointed general manager of sales of the **A. M. Byers Company** to succeed the late Myron J. Czarniecki, and **H. R. Rowland** has been appointed assistant general manager of sales.

Walter H. Robertson has been appointed manager of piling sales and engineering of the **Union Metal Manufacturing Company,** with headquarters at Canton, Ohio. **Cove W. Sullivan,** manager of piling sales and engineering, has been appointed manager of the New York district, handling the sale of all of the company's regular products. **R. A. Weinland,** in addition to his work as sub-contractor supervisor, has been named Lake States district manager. **Joseph A. Coblentz,** has been appointed sales engineer, at Baltimore, Md.

Mr. Robertson is a graduate of the

Walter H. Robertson

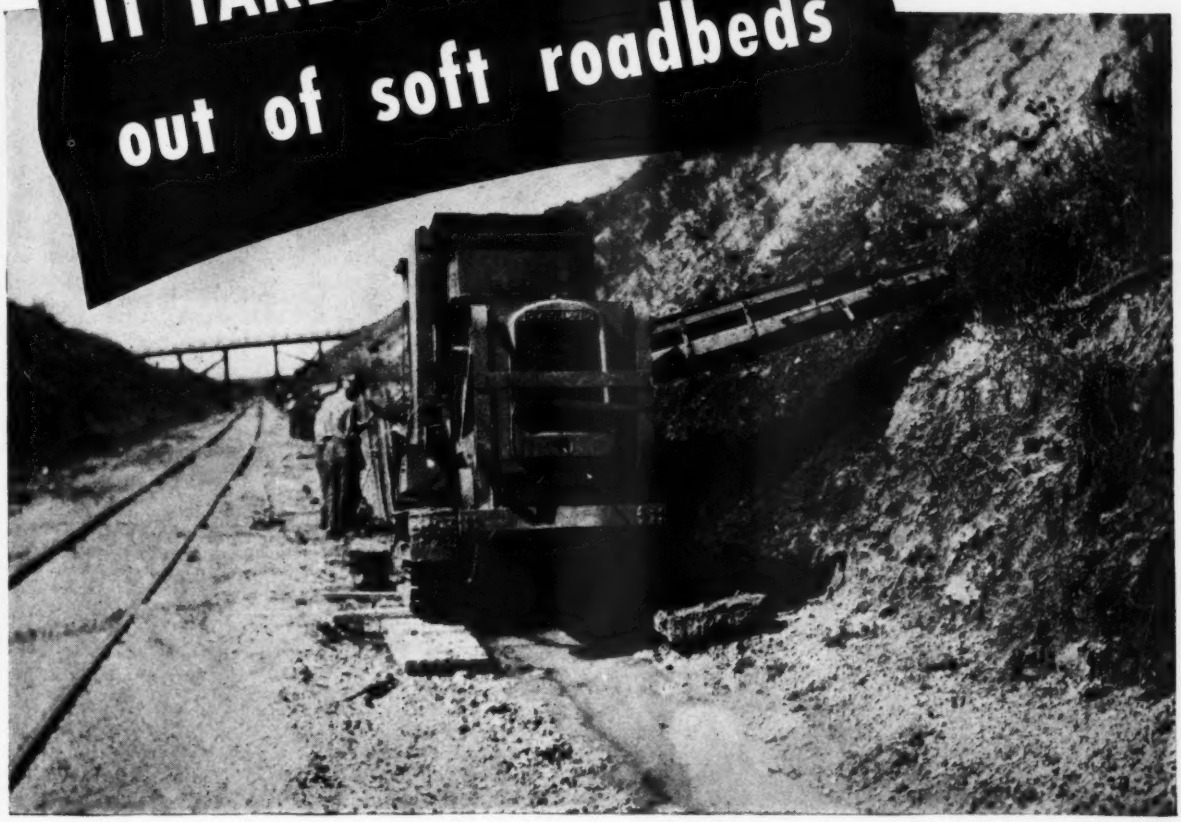
Massachusetts Institute of Technology and of Harvard University. Prior to joining the Union Metal Manufacturing Company he was vice-president in charge of sales and engineering developments of the Massey Concrete Products Co.

Obituary

L. E. Elliott, service engineer of the National Aluminate Corporation, Chicago, with headquarters at Lexington, Ky., died in Excelsior, Minn., on July 20.

Pamphlet Illustrates Deepwell Pumps—The Byron-Jackson Co., Los Angeles, Cal., has issued a bulletin describing its line of Deepwell pumps. Printed in three colors, the bulletin contains photographs and cut-away diagrams of various styles of turbine pumps for use in deep wells, giving specifications and performance data.

IT TAKES THE SHIMMY out of soft roadbeds



Slides and saturated subgrade once made this 3000-foot cut troublesome to an important freight line in the West. Here workmen are installing 8-inch ARMCO Perforated Pipe at 9-foot depth, backfilling with gravel and sealing the top with clay to prevent entrance of surface-water.

Water pockets are unwelcome bedpartners on any rail line. They soften the subgrade, give roadbeds the fidgets, and are a constant source of worry and expense.

Strong, tight-jointed ARMCO Perforated Pipe is a sure cure. Proper use of this durable pipe assures fast, efficient subdrainage—either in old or new roadbeds.

For years this western rail line was plagued by trouble-making groundwater. Maintenance costs were high. So engineers installed ARMCO Perforated Pipe. Now, thanks to a firm dry subgrade, it costs far less to keep the roadbed in top shape. It will *stay that way too.*

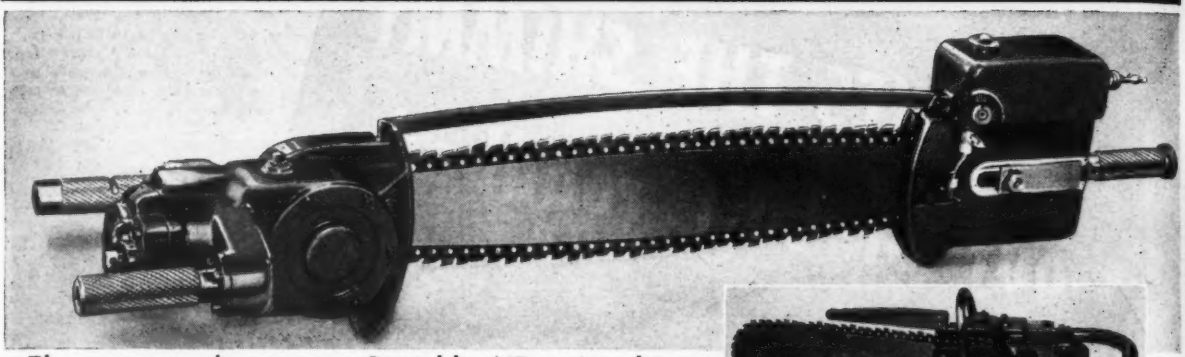
ARMCO Perforated Pipe resists crushing and disjointing. Flexible, corrugated metal design and strong, tight joints see to that. It ends your worries over traffic vibration, heavy loads, shifting soils or frost action.

This sturdy pipe is easy to install. No special tools are needed. Long lengths are quickly joined by sturdy coupling bands to form a strong, trouble-free conduit. The job soon pays for itself in lower maintenance costs. Ask us for the facts. Write the Armco Railroad Sales Co. Incorporated, 281 Curtis Street, Middletown, Ohio, or to our nearest district office.

ARMCO

ARMCO PERFORATED PIPE

Immediate delivery—WITHOUT priority!



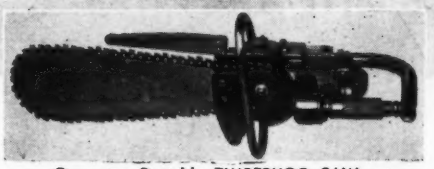
The same sturdy two-man Portable AIR motor driven

TIMBERHOG SAW

used by our Armed Forces is now ready for civilian use!

Powered by a 3½ HP air motor, operating at 90 to 105 lbs. pressure, this endless chain saw (see above) is recommended for general construction, timber, railroad, mine, shipyard and plant maintenance work. Available in 24" capacity — weight 50 lbs.

"Original and Largest manufacturers of portable timber saws—since 1927"



One man Portable TIMBERHOG SAW—same sturdy construction—20" capacity, weight 36 lbs.

For heavy duty this two-man TIMBERHOG SAW is made in 24" and 36" capacity. Powered by 4.1 HP air motor; wt. 36" capacity—85 lbs. Immediate delivery. Priority required.

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TIMBERHOG SAWS
WORCESTER MASS., U.S.A.

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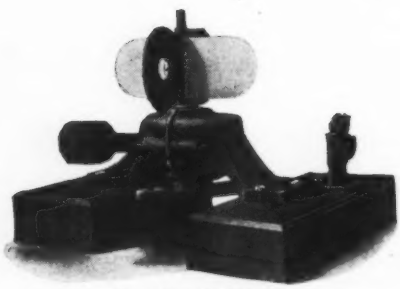
SIGNALS
QUALITY

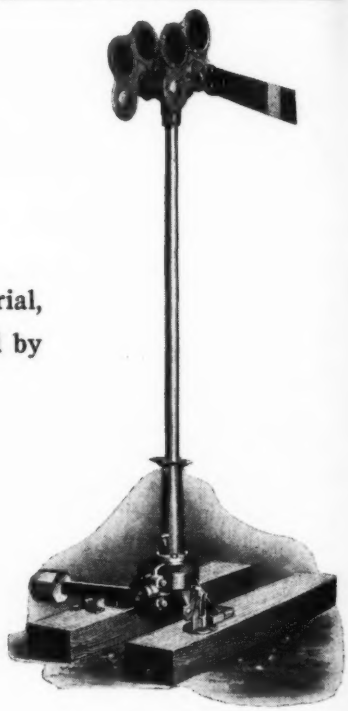
Years of engineering skill incorporated with right material, attest to the high quality of this equipment—preferred by yardmen.

Featuring

- ★ Easy operation
- ★ Ample housing protection against dirt and corrosion
- ★ Insured safety for switch throwers
- ★ Oiling, inspection and maintenance convenience
- ★ Designed and constructed for maximum strength and durability



Ground or Yard Stand



Low Semaphore Switch Stand with Revolving Lamp

U. S.-CHALLENGE COMPANY

Division of Batavia Metal Products, Inc.

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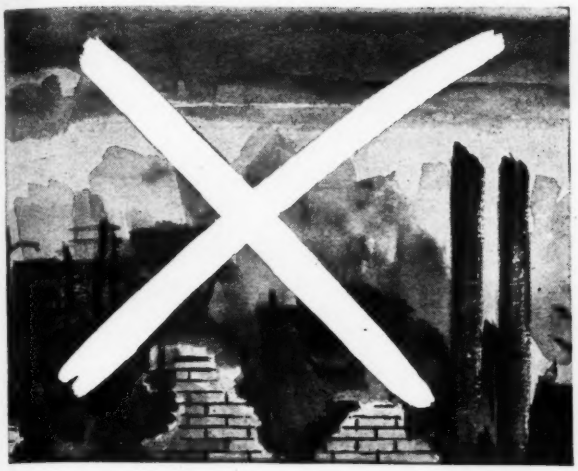


Marks the Spot!

Many accidental fires . . . caused by spontaneous combustion, stray sparks or improper containers can be prevented by the systematic intallation of Justrite Safety Products.

JUSTRITE SAFETY GASOLINE CANS

This equipment offers a safe, efficient and economical way to protect power equipment and maintenance crews from the hazards of fire and explosion.

The Justrite Safety Gasoline Can is equipped with a specially designed, non-spilling lip on a large nozzle and eliminates the need of a funnel. The "Swing" handle is also an exclusive Justrite feature designed to balance the load and make the can easy to handle, fill and carry. "Trigger" handles are provided on the small size cans from 1-pint to 1-gallon. The body is 24 gauge steel double seamed and soldered with a heavily coated baked-on, high gloss, red enamel finish. These cans are built for rugged service and safety . . . Justrite.

INSPECTED AND LABELED FOR SAFETY

Justrite Safety Gasoline Cans and Oily Waste Cans are approved for safety by Underwriters' Laboratories, Inc. and the Associated Factory Mutual Fire Insurance Companies.

JUSTRITE OILY WASTE CANS

These cans provide maximum protection against the hazards of fire and spontaneous combustion from oily, dangerous waste that accumulates around power equipment in section sheds and machine shops. The top closes automatically. Equipped with or without foot lever opener.

The body is No. 24 gauge galvanized sheet steel double seamed and soldered. Legs and handles are ⅛" band iron. Justrite Oily Waste Cans come in sizes to meet your needs for practical, efficient and safe containers for the handling of flammable waste material.

Ask you supplier about . . . Justrite Safety Products. They're standard equipment with many railroads.

JUSTRITE MANUFACTURING COMPANY

2063 N. Southport Ave., Dept. D-7, Chicago 14, Ill.

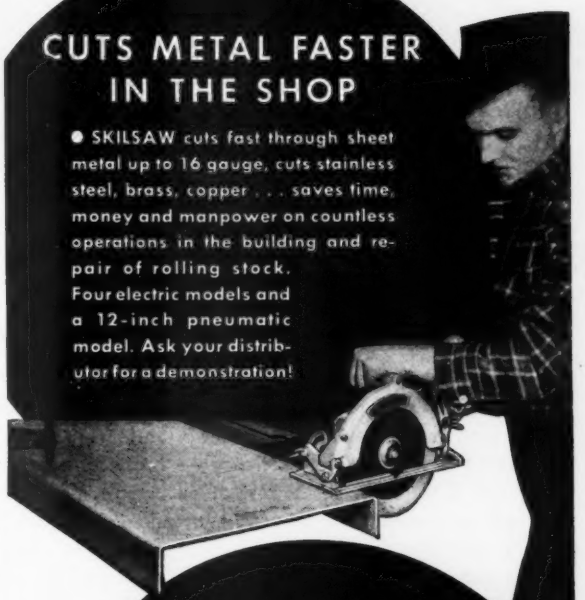
JUSTRITE *Safety Products*

SAFETY CANS · FILLING CANS · OILY WASTE CANS
APPROVED SAFETY ELECTRIC LANTERNS

SKILSAW
SPEEDS THE
BIG CUTTING JOBS!

CUTS METAL FASTER IN THE SHOP

● SKILSAW cuts fast through sheet metal up to 16 gauge, cuts stainless steel, brass, copper . . . saves time, money and manpower on countless operations in the building and repair of rolling stock. Four electric models and a 12-inch pneumatic model. Ask your distributor for a demonstration!



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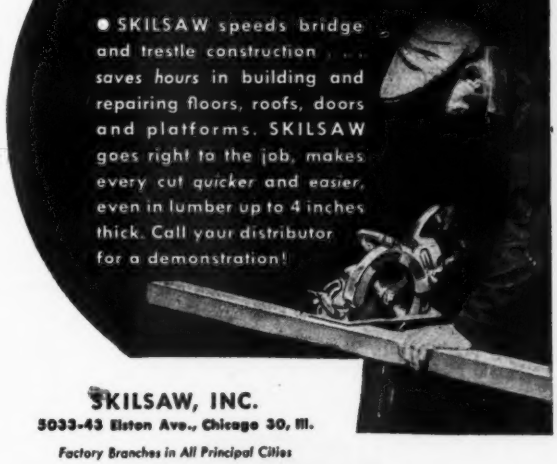
● SKILSAW speeds bridge and trestle construction . . . *saves hours* in building and repairing floors, roofs, doors and platforms. SKILSAW goes right to the job, makes every cut *quicker* and *easier*, even in lumber up to 4 inches thick. Call your distributor for a demonstration!



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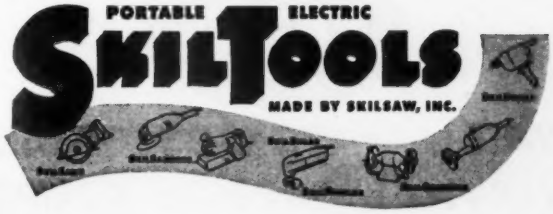
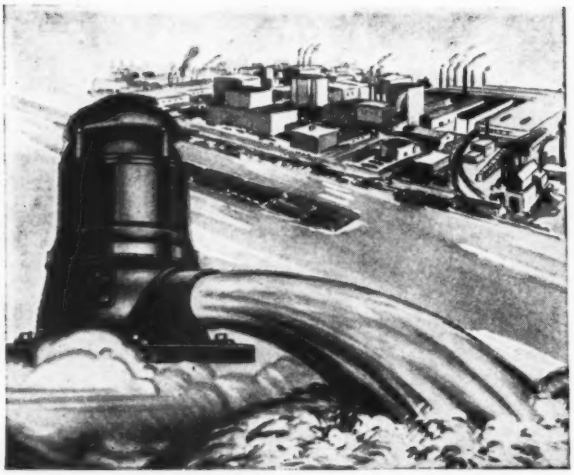
5033-43 Elston Ave., Chicago 30, Ill.
Factory Branches in All Principal Cities

PORTABLE ELECTRIC
SKILTOOLS
MADE BY SKILSAW, INC.





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Waiting days are over! You can NOW go ahead with new building and expansion plans for a bigger and better Water System—a Layne Well Water System that will operate with the utmost efficiency — produce greater quantities of water at the lowest of all in power cost.

Layne will need no time for conversion! The entire factory and all Layne Affiliated Companies with their drilling and installation crews are ready—and now are in action building Well Water Systems for all type of industries, cities, villages, mines, and irrigation projects.

You will want your new well water system to embody the many outstanding and exclusive Layne features. You will want the Layne ruggedness of quality that insures longer life and the Layne unmatched high efficiency for low operation cost.

Better write—or wire for full details of Layne's all inclusive Well Water Development service. For catalogs, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

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WELL WATER SYSTEMS
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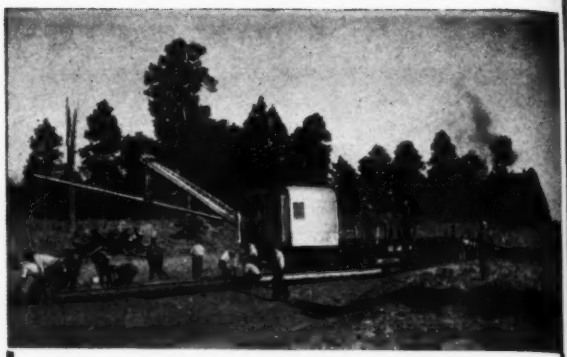

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With Burro Cranes

Burro Cranes are easy to handle, speedy and versatile. They're designed and built for railroad work—to do it faster, better, to save locomotive and work train hours in hauling and switching—to cut to a minimum the travel time between jobs—in short, to give you more crane hours on more different kinds of jobs under widely varying conditions. Burro Cranes not only pay their way with more and more continuous work, but they save you money besides in many items of operational expense.

- Short Tail Swing
- Independent Friction Clutches
- Drawbar pull up to 7500 lbs.
- Travel speeds up to 27 m.p.h.
- Elevated Boom Heels
- Low Overall height
- Sets itself off and on track
- Can be equipped for magnet, pile-driver, air-brakes, etc.

EVERY RAILROAD NEEDS BURRO CRANES

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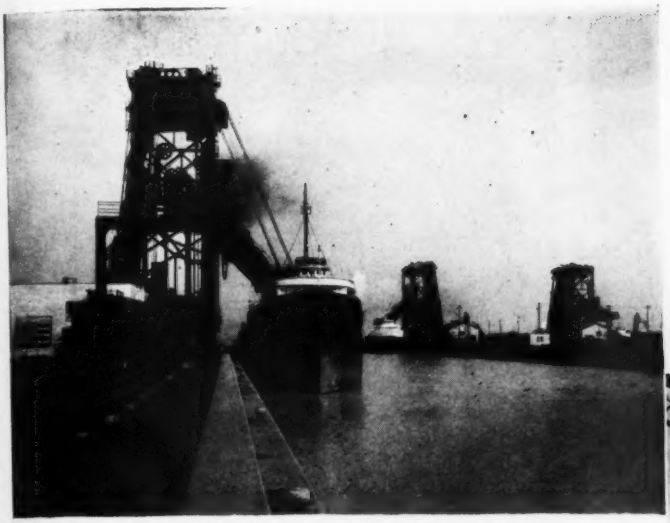
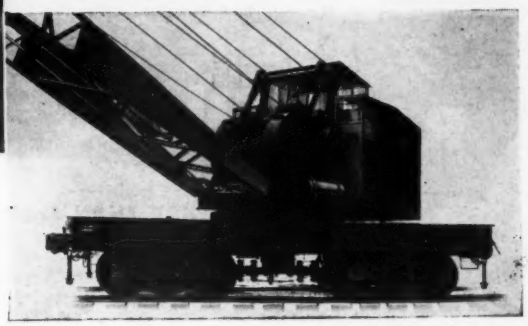
I. B. EQUIPMENT PERFORMS FAITHFULLY IN SCORES OF INDUSTRIES



The three I.B. High-Lift Electric Car Dumpers (left) installed at a Great Lakes coal dock typify the engineering and construction superiority that has made the name, Industrial Brownhoist, one of the most respected of manufacturers of heavy-duty material handling equipment. These giant dumpers empty sixty 120-ton capacity coal cars per hour—one a minute!—easily, cleanly, at low cost. • An important feature of I.B. gasoline and Diesel Locomotive Cranes—(below) known the world over for dependable low-cost performance with magnet, hook, or bucket—is the patented Monitor-type cab which permits 360° visibility. Regardless of your material handling needs, get the facts first from I.B.



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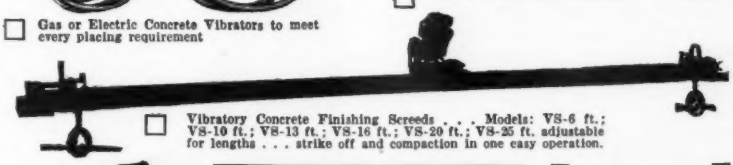

☐ Vibratory Concrete Finishing Screeds . . . Models: VS-6 ft.; VS-10 ft.; VS-13 ft.; VS-16 ft.; VS-20 ft.; VS-25 ft. adjustable for lengths . . . strike off and compaction in one easy operation.

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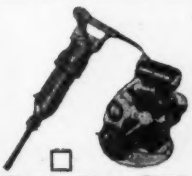

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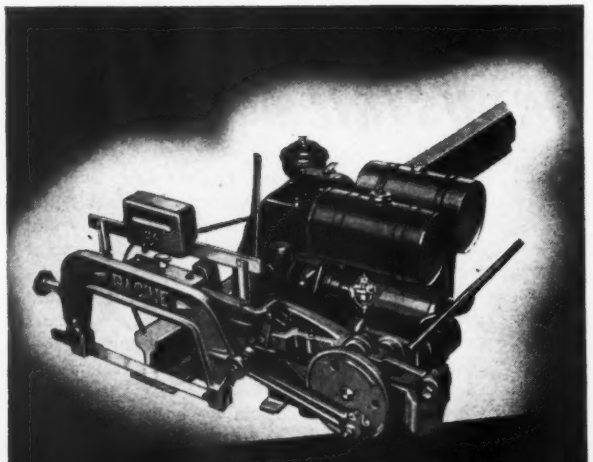

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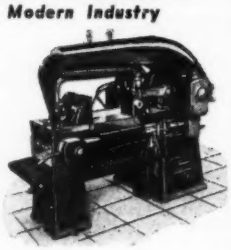

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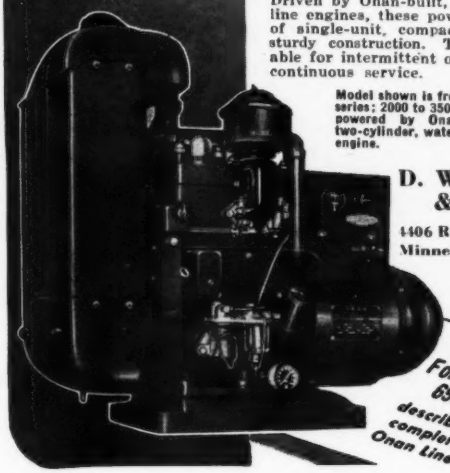

Model shown is from W2C series; 2000 to 3500 watts; powered by Onan-built, two-cylinder, water-cooled engine.

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Using the Wisconsin-powered Fairmont W61 Series "A" Oil Spray Car, a 3-man section gang can spray rail joints at the rate of one mile an hour, spraying both sides of the angle bars. The outfit illustrated and described here is made by Fairmont Railway Motors, Inc., of Fairmont, Minn.

This manufacturer, like many others in the railway maintenance field, has learned through long experience that Wisconsin Heavy-Duty Air-Cooled Engines can be depended upon for continuous service with a minimum of servicing. Make sure that your equipment is Wisconsin-powered.

Most H.P. per pound

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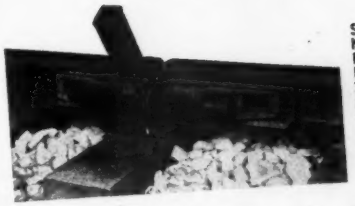

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Joints can be properly spaced and rail ends, bolt and crossing damage prevented by one man with the Simplex Rail Puller and Expander. . Service need not be interrupted when this tool is in use, as the alloy steel, heat-treated U-bar stiffens the joint, permitting train passage.

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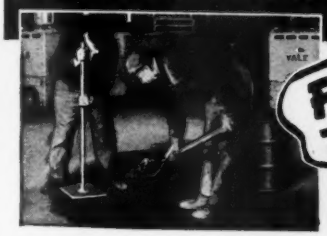

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Please send me complete INSTANT-USE information and details of FREE TRIAL OFFER—no obligation.

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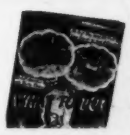

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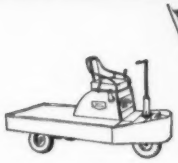

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